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IS THERE ENOUGH GOLD?

IS THERE ENOUGH GOLD?

BY
CHARLES O. HARDY

WASHINGTON, D.C.
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1936

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DIRECTOR'S PREFACE

With the present trend toward world economic recovery it seems certain that restoration of the gold standard will before long become an important question of policy in many countries. If so, it will be a controversial question; in addition to the inevitable clashes of financial interests, there are wide differences of opinion both as to the benefits and the costs of currency instability and as to the practicability of restoring the gold standard. The present volume does not attempt to deal with the whole question of stabilization, but merely to answer a question of feasibility. Given a general restoration of industrial activity, would the prospective gold supply be sufficient to support the prospective volume of world trade at gold price levels as high as those of 1924-29, without drastic changes in the monetary institutions which determine the amount of gold that is needed?

The grounds on which Dr. Hardy bases his optimistic conclusion should prove of interest and value in the formation of public opinion on the restoration issue. Certain other suggestions which grow out of this conclusion are not less important.

As Part II of this volume there is reprinted, with some revisions, Dr. Hardy's pamphlet entitled *The Warren-Pearson Price Theory*, which was published in 1935 as a preprint from a projected study of the effects of devaluation. The fact that the present study is brought to completion earlier than the projected exchange study, plus the fact that the pamphlet seems equally appropriate for inclusion in either study, has led to its transfer to the present volume.

Dr. Rufus Tucker has kindly offered us an opportunity to publish as Appendix A an appraisal of the wholesale price indexes which have generally been used in studies of the relationship between gold supply and price level. His conclusions will, we believe, be of great interest both to statisticians and to serious students of monetary problems.

The author wishes to express his appreciation of the courtesy of Morris Bailkin, who permitted him to consult an unpublished paper entitled *The Adequacy of the Gold Supply*, a Master's thesis presented by Mr. Bailkin at the University of Pennsylvania.

This volume is the third in a series of current studies of significant developments in the financial system of the United States, the first being *Current Monetary Issues*, by Leo Pasvolsky, published in December 1933, and the second, *Closed and Distressed Banks*, by Cyril B. Upham and Edwin Lamke, which was published in November 1934. In the planning of this series we have had the aid of an advisory committee of the Social Science Research Council.

Harold G. Moulton and Leo Pasvolsky served on the committee which read this manuscript as representatives of the Institute of Economics.

EDWIN G. NOURSE
Director

Institute of Economics
May 1936

CONTENTS

	PAGE
DIRECTOR'S PREFACE	vii
PART I. THE ADEQUACY OF THE GOLD SUPPLY	
INTRODUCTION	3
CHAPTER I	
OBJECTIVES AND WORKING ASSUMPTIONS OF PRESENT STUDY	9
CHAPTER II	
GOLD AND PRICES BEFORE AND AFTER THE WAR	18
Pre-War Gold-Price Relationships	18
Post-War Gold-Price Relationships	32
Conclusion	38
CHAPTER III	
THE PRODUCTION OF NEW GOLD	41
Past Production of Gold	42
Estimates of Future Gold Production	43
South Africa	45
Production outside South Africa	58
Summary	60
Addendum	64
CHAPTER IV	
THE NON-MONETARY CONSUMPTION OF GOLD	69
Industrial Consumption	69
Oriental Accumulation	77
Hoarding in Europe	80
CHAPTER V	
THE OUTLOOK FOR GOLD: SURPLUS OR DEFICIT	83
CHAPTER VI	
THE INTERNATIONAL DISTRIBUTION OF THE MONE- TARY GOLD SUPPLY	90

	PAGE
Gold Holdings of Central Banks and Governments . . .	90
Causes and Effects of the International Distribution of Gold	95
The Gold Holdings of the United States	103
The Outlook for Redistribution of Gold	115
CHAPTER VII	
CONCLUSIONS	122
PART II. THE WARREN-PEARSON PRICE THEORY	
INTRODUCTION	127
CHAPTER VIII	
THE PRE-WAR GOLD-PRICE RELATIONSHIPS	130
CHAPTER IX	
THE POST-WAR SITUATION	148
CHAPTER X	
DEVALUATION AND PRICES, 1933-34	165
APPENDIXES	
APPENDIX A	
(By Rufus S. Tucker)	
THE MYTH OF 1849	177
APPENDIX B	
SOME CRITICISMS OF THE LITERATURE	200
APPENDIX C	
ESTIMATES OF WORLD GOLD STOCK OF 1913	205
INDEX	211

PART I
THE ADEQUACY OF THE GOLD SUPPLY

INTRODUCTION

In 1930 one of the world's leading economic authorities said: "The business cycle, as it is called, and the adequacy of the world's gold supply constitute probably the two most important economic problems which the world has to face today."¹ Loveday's remark reflects an opinion that was common among students of monetary economics throughout the years after 1920, when the gold standard was rapidly regaining its pre-war world position. There was widespread fear that the most important gold mines of the world were facing exhaustion, while at the same time there was abroad in the world a deep-seated conviction that the maintenance of the existing gold price level was imperative.

Since 1930, interest in this issue, as in other problems of the longer future, has been overshadowed by the more urgent desire to find ways of overcoming the depression and restoring a reasonable degree of freedom in the international movement of commodities and services. The slackening of industrial activity, the release of gold from India, the stimulus the depression has given to gold production, and the great increases in the nominal value of existing gold stocks caused by the devaluation of important currencies, all have combined to increase the volume of unutilized gold resources, while at the same time the suspension of gold redemption has relieved most monetary authorities from the necessity of watching anxiously the rise and fall of their gold stocks.

However, if Loveday was right in 1930, the problem is still important today. As soon as the question of restoring the international gold standard is seriously faced, there will be a revival of interest in the prospective ade-

¹ A. Loveday, *Britain and World Trade*, p. 115.

quacy of the gold supply, for any reconstruction of the world's monetary systems along pre-war lines must be based on an adequate gold supply; hence the decision as to whether reconstruction should proceed along these or other lines will depend in no small degree on the outlook for gold-mining and gold-using industries.

For the benefit of the reader who is interested only in our conclusions and not in our reasons, it may be stated here that we find: first, that even in 1929 there was no justification for the pessimism that prevailed about the gold supply in prospect over the next decade; second, that in the light of new developments since that time, together with fuller knowledge of what the conditions then were, the real risk to be guarded against in planning a restoration of the gold standard is that of an excessive supply of gold.²

Before the World War, most of the currency systems of the world were classified as "gold standard." Each of the monetary units was legally prescribed as a certain weight of gold of a particular fineness. Gold was freely bought and sold in unlimited amounts at a fixed price, either by a government or by a central bank. All forms of domestic money were convertible into gold on demand, such conversion being guaranteed by law or by custom, and there was no restriction on the import or export of gold. To insure redeemability of paper money, its issuance was limited either to a maximum fixed by law, the excess to be covered by gold, or more commonly by the requirement that a percentage gold reserve be held against the note circulation. Since commercial banks in countries where checks were an important medium of exchange also kept reserves of money or central bank

² For a fuller statement of conclusions see Chap. VII.

deposits against their deposits, fixed in amount either by law or by custom, the amount of money that could be in circulation, including bank deposits, depended loosely on the amount of monetary gold. However, the relationship between the volume of gold reserve and the total monetary supply was subject to change, first, because of changing requirements and customs and, second, because of changes in the proportions of notes and bank deposits in the total. In general the tendency was for the ratio of reserve to effective circulation to decline, because of the increased use of banks. On the other hand, the requirement for gold was somewhat increased by the practical elimination of silver from the world's stock of reserve metal.

During the war, and for several years afterward, every country either abandoned the gold standard or modified it greatly. There was an era of inconvertible paper, gold restrictions, and wildly fluctuating exchange rates. Then, beginning in 1924, there came a rapid restoration of the gold standard. By 1928 the transition had largely been completed, and the world once again was on the gold standard, though the standard had been modified in several ways from that of the pre-war years. These modifications were motivated in no small degree by the fear of a gold shortage, which prevailed from the very beginning of the effort to restore the gold standard. The Genoa Conference of 1922 recommended innovations to economize the use of gold, as follows:

The convention should embody some means of economizing the use of gold by maintaining reserves in the form of foreign balances, such, for example, as the gold-exchange standard or an international clearing system.⁸

⁸ Resolution 9, *Report of the Financial Commission of the Genoa Conference*, Apr. 20, 1922. Reprinted in the *Federal Reserve Bulletin*, June

This recommendation was followed in the majority of cases where new central banks were established or old ones reorganized. It was also an almost invariable practice in the new monetary systems which were set up in the years following 1924 to provide for the withdrawal of gold coin from circulation, its concentration in central reserves, and its use for the settlement of foreign balances only.

In large part this solicitude about gold arose from the efforts of a number of countries to return to gold at or near their old parities, although during the war and early post-war periods they had enormously expanded the volume of their respective circulating media, and their price levels had risen far above those of the pre-war years. For countries like Germany and Poland which had to make enormous devaluations in their currencies anyway, this was a matter of minor importance, since there had to be new price levels and these could as readily be adjusted to one world gold base as another. But for countries which were trying to restore the old parity, and for others which were trying to come as close to it as possible, it seemed important that the price readjustment be as small as possible; hence, that the volume of currency be considerably above pre-war levels.

The anxiety which was felt at this time concerning the adequacy of the gold supply to support the expanded volume of currency and the relatively high post-war price level, probably exerted a psychological influence on public opinion during the years that followed. Though prices did fall from the high level of the war period, they remained considerably higher than before the war, and there was widespread fear that the gold supply

1933, p. 678. The reference is to a proposed international convention "to centralize and co-ordinate" the demand for gold.

would not be sufficient to support the currency and credit which would be required at the existing price level.

Apprehension of a falling price level on account of a present or future shortage of gold led to the appointment, by the Financial Committee of the League of Nations in 1929, of a special committee known as the Gold Delegation to carry out an investigation of the subject. The studies made by this committee are the most important source of information in regard to the world gold situation as it stood before the great depression.

The Delegation did not find evidence of the existence of a gold shortage,⁴ but its conclusions as to the outlook for the future were pessimistic. These conclusions were summarized by Loveday as follows:

The supply of monetary gold in the future will consist of the present monetary stock, which is not likely to be eaten into, and the additions to it drawn either from new gold mined or from old gold melted. The present stock amounts to something over \$11,000 millions; somewhat over \$400 millions of new gold are mined today in the course of a year. But according to the opinion of geological experts unless new deposits of unusual importance are discovered the output of mines is likely to diminish in a few years' time and sink to well under \$400 millions before 1940. How great the diminution will be it is impossible to foretell. The estimates of experts concerning the probable output in, for instance, 1940 range from \$314-370 millions. But that a considerable reduction is probable on ac-

⁴ There have been some attempts to explain the world economic crisis by a lack of gold. Thus Sir Henry Strakosch said in 1930 that there was "a fundamental cause [of depression], and it is this, that the gold production does not keep pace with the economic development of the world." (*Minutes of the Royal Committee on Finance and Industry in England*, Vol. 2, p. 35, par. 5714.) Warren and Pearson also hold this view (compare Part II of this volume). However, most students, even those who are deeply concerned about the future of the gold supply, reject this view, and believe that it is only the long-time trend of prices which is likely to be affected seriously by a gold shortage.

count mainly of the exhaustion of the South African mines, which account for over half of present production—almost all agree. Of the total supplies of new gold it would appear that somewhat under one-half are purchased by India and for industrial purposes in normal times. During the recent months of depression industrial demand has weakened. India alone takes from \$70-90 millions per annum. Obviously, if gold does not go out of fashion, and it has been in fashion in all ages of history, and if India does not change her prehistoric habits, the proportion of total gold mines available for money will tend to diminish as that total diminishes. It has been concluded therefore, on the average, somewhat over \$200 millions are now added to the monetary stock each year and that by 1940 a considerably lower sum, if industrial demand does not increase, lying possibly between \$120 and \$170 millions, will be available for this purpose.⁵

In spite of differences of opinion as to the precise relationship between additions to gold stocks and the maintenance of prices, it is obvious that a decline in the rate of flow of gold into the monetary stocks from a level of 200 million dollars to around 150 million dollars would require some readjustment of monetary practice if the gold standard was to continue indefinitely to function in the same fashion as heretofore. Either the supply that came forward in the post-war years was excessive or else the supply that the experts forecast for 1935 and following years was inadequate.

⁵ Loveday, *Britain and World Trade*, pp. 139-40.

CHAPTER I

OBJECTIVES AND WORKING ASSUMPTIONS OF THE PRESENT STUDY

The concept of adequacy is not self-explanatory. A definition sufficiently precise to form the basis of an exploration of the prospective adequacy of the gold supply involves the laying down of assumptions: first, with regard to the objectives to be attained by an ideal monetary system; second, with regard to the effects which a given change in the gold supply might be expected to have on the total supply of all kinds of money;¹ and third, as to the connection between the supply of money and the movement of prices, money incomes, or whatever standard may be selected as the test of adequacy or inadequacy.

The size of the gold stock is obviously a matter of indifference unless it exercises a major influence on the movement of some significant economic variable. And even if prices, incomes, wages, or some other variable depended absolutely on the size of the gold stock the latter would still be a matter of indifference if the movement of the dependent element could not be proved, or reasonably assumed, to be a matter of genuine economic importance.

With regard to the first point, that is, the standard by which the effectiveness of the working of a monetary system is to be tested, only two alternatives seem to call for serious consideration, namely, long-term stability of prices and long-term stability of money income.² Short-

¹ Throughout this study the term "money" includes bank deposits, unless otherwise indicated.

² In a complete study of the subject, consideration might be given also to a gently rising trend of prices as an alternative standard; acceptance

term stability either of prices or of income is excluded from consideration because changes in the total monetary gold stocks are not sudden or sharp enough to bring about any such variations of prices as are observable in the course of an ordinary business cycle, and for other reasons which are indicated below. Stability in the sense in which we shall use the term refers to the absence of any long-term trend either upward or downward; it has no reference to the extent of cyclical fluctuations about the horizontal trend. Since most scientific discussion of the question has run in terms of price stability, and since by this test the minimum necessary gold supply is larger than by the other test, we shall confine this study to an examination of prospective adequacy as measured by the price standard.

Moreover, for purposes of this discussion we shall not go back of the usual current assumption that wholesale price indexes of the sort ordinarily cited furnish a significant test of adequacy. In general the tendency is for wholesale prices to show a falling trend in comparison with wages, since the productivity of labor, as measured in commodities, tends to increase. Retail prices and the cost of living pursue courses intermediate between that of wholesale prices and that of wages, since the costs of goods at retail are a combination of material costs and labor costs. In the writer's opinion the need for money in terms of stability of production is adequately met if there is no downward pressure on the wage level. But since this is a theoretical issue of a highly controversial

of this standard would only slightly modify the conclusions reached in the text. It may be assumed that other possible objectives, such as stabilization of the volume of employment and encouragement of maximum production, in so far as they are dependent on the money supply, are affected through the price level and would accompany one or the other type of stability referred to in the text.

character, involving such problems as the causes of the business cycle and the relationship between bank credit and capital formation, it has seemed best to confine the present study to examination of the prospect for a gold supply which will be adequate on the basis of the tests used by the leading students who have reached pessimistic conclusions; hence our discussion runs in terms of wholesale prices. (For criticism of some of the indexes used, compare Appendix A.)

With regard to the second point, the assumption of this study is that in any general restoration of the gold standard the relationships between gold reserves and money volume which were established by world monetary regulations and customary practices in the years just before the recent collapse of the gold standard would be re-established and continued indefinitely, except for changes which have occurred since 1929 that seem likely to be permanent, such as the withdrawal of gold coin from circulation in the United States. This is in general the assumption of the other studies which we have to review. It does not mean that no changes in monetary institutions are desirable or are likely to occur. It simply means that since the purpose of a study of the adequacy of the gold supply is to determine whether the prospective supply is such as to make changes in monetary institutions desirable, the adequacy of the supply must be examined on the assumption that no such changes take place.

Our third point, namely, the extent to which the level of prices (or of income) is dependent upon the volume of money, and hence under the gold standard upon the size of the gold stock, involves an ancient controversy. Obviously some assumption must be made on this point and, just as obviously, it is impossible within reasonable

space limits to justify the assumption by a complete analysis of the question and appraisal of conflicting theories. The working assumptions of the study may be stated as follows.

It has been a commonplace of economic discussion that, other things being equal, prices vary with the quantity of money, and also that if all other things except the volume of trade remain constant, prices vary directly with the quantity of money and inversely with the volume of trade. The "quantity theory," about which controversy raged a generation ago, held that prices actually do vary with the quantity of money and inversely with the volume of trade because "other things" actually do remain substantially equal: that is, that the volume of bank deposits varies directly with the size of the underlying reserves; that the velocity of circulation of both money and bank deposits is not affected, except temporarily, by changes in quantity; and that, except for transition periods, the volume of transactions is independent of the money supply.³ Given a long enough run this doctrine is unobjectionable; there is no reason to suppose that ultimately the volume of business transacted or the frequency with which a unit of money is expended would be different with one money supply from what it would be with another. But it has become obvious (a) that over the periods in which economists are chiefly interested the volume of trade is greatly affected by changes, actual or anticipated, in the price level; (b) that velocity changes are frequently the result of changes in the quantity of money; and (c) that both the relationship of the volume of bank deposits to the volume of money and the rate of turnover of money and bank deposits are also subject to wide and sudden

³ Compare Irving Fisher, *The Purchasing Power of Money*, 1916.

variations which do not originate in the quantity of money or the level of prices.

The last point is particularly important with reference to the short-term changes which are connected with the alternations of prosperity and depression. In the course of a major cycle the changes in the relation of the volume of bank credit to the underlying gold reserves and in the intensity of utilization of both currency and credit are so great as to make the small changes which occur in the world's gold supply a remote and relatively insignificant factor in the fluctuation of the price level. Even the relatively much larger changes in the supply of gold and of credit money in individual countries are frequently overshadowed by changes in velocity and in volume of trade; hence do not bring about corresponding changes in prices. For instance, in the course of the tremendous price collapse of 1929-32 the volume of gold increased rapidly and the volume of currency and bank deposits in many countries showed no significant decline. Hence, for purposes of short-run analysis it is impossible to make any real use of the familiar generalization that "all other things being equal" prices vary with the quantity of money.

If there were an equal absence of relationship between the long-term trends of the money supply and of prices and incomes, or if the long-period changes in the proportion of other forms of currency to gold were violent and unpredictable, the concept of the prospective adequacy of the gold supply would be practically meaningless. But over long periods there is no evidence of any such wide variation in the ratio of the volume of money to that of monetary transactions as does exist with reference to the short-run fluctuations, and there is no strong reason to anticipate such variations. Hence it seems rea-

sonable to ignore any future trend in the direction of either more intensive or less intensive use of the available money stock; in other words, to accept the validity of the quantity formula with reference to the *trends* of money, of prices, and of money incomes. This procedure is the more justifiable because with restoration and maintenance of the gold standard any trend in the velocity of turnover of money that did appear in the immediate future would probably be upward;⁴ hence the error would consist in overstating rather than understating prospective requirements for money.

The difference between short-run and long-run relationship of gold and prices, under the gold standard as it has operated in the past, may be tentatively stated as follows: The world gold supply sets the upper limit to the currency supply of the world, and the gold supply of a country sets an upper limit to the monetary supply of that country. Ordinarily there is a considerable slack in the system, and an increase of gold tends in the short run to increase the slack rather than to bring about a proportionate rise of the money supply. But in boom periods when the volume of money tends to increase faster than the volume of gold, the limits may become effective. In the course of a long period booms recur, and after a boom the money supply does not as a rule contract as much as it has expanded during the boom. The trend of the gold supply, therefore, by fixing the limits to which money can expand in periods of boom, does fix the trend of the money supply, subject to qualifications noted in the second paragraph below.

Likewise with the relationship of the money supply to prices: the first effect of an increase of money may

⁴ Because of a decline in the hoarding of currency and the holding of idle bank funds, with growing confidence in monetary stability.

be an increase in the use of money as an instrumentality of saving, rather than an increase of spending. This is particularly true in depressions, when an attempt to push up the volume of expenditures by increasing the supply of money is like pushing on a string. But at other times the opposite is true; expenditures increase more rapidly than does money. And the periods when money expands most rapidly are also in general the periods of maximum velocity of circulation of money; that is, they are the periods when a given money supply will support the highest price level. This is most conspicuous in the case of the great fiscal inflations, but it is usually true also of business booms. Hence, other things being equal, over a period of years, the maximum points in the price curve would be determined, under the gold standard, by the course of gold production, and these maxima would determine the trend.

But the trends of the money supply and of prices are subject to modification from changes in other factors, such as the number of countries adhering to the gold standard, the required and customary ratios of gold reserves to outstanding credit and currency, the relative amounts of currency and bank deposits used, Indian absorption and non-monetary consumption of gold, and customary practice with regard to the holding of unspent balances. For the purpose of this investigation we are assuming no change in these factors, since we have no reason to anticipate a change in one direction rather than the other in any of them except the monetary practice with regard to gold reserves, and since our purpose is to throw light on the necessity for changing that factor. It is to be noted, however, that all these factors except the one mentioned last, the velocity of circulation, have changed materially during the last century and allow-

ance must be made for these changes in interpreting the price history of the century.

In considering the adequacy of the prospective gold supply to support a given price level, it is necessary to exclude from consideration any increase in the production of gold which might result from a fall of prices of other things. Moreover, since the monetary incomes of all civilized countries have fallen sharply during the years since 1929, and since a rise in prices and money incomes is generally believed to be desirable, it is appropriate to examine the prospective gold supply primarily with regard to the adequacy of the supply that would be produced with general prices at the 1929 level, rather than at the levels of 1930-35.⁵

Since, however, there is no reason to anticipate the absence of business fluctuations in the future, the monetary demands and costs of production assumed should reflect neither the high prosperity conditions of 1925-29 nor the depression conditions of 1930-35, but average conditions rather more favorable to gold production than was the period 1925-29 and less favorable than the depression years which followed. So far as the production of gold is concerned, this qualification is important, since, as is shown below, this industry is extremely sensitive, inversely, to changes in the activity of other industries.

While, as we have noted, any computation of the adequacy of the gold supply should by assumption exclude changes in the cost of gold production that are part of a general change in the levels of prices and wages,

⁵ As we shall see, the money costs of mining gold in the Transvaal, which is by far the most important source of supply, have been affected surprisingly little either by the depression or by the deflation of the South African pound.

the assumptions should not exclude changes in costs that are due to the progress of technology in the gold-mining industry, new discoveries, exhaustion of mines, changes in available labor supply, and other special factors.

Finally, it is to be noted that the height of the world price level which corresponds to a given gold stock is a question which does not admit of a precise answer. It is a quantitative question on which pure theory throws no light, and the results of inductive study are only very rough approximations—as is the case with all questions involving long-term economic trends. Observation of a short period will not establish a trend, and over a long period the relations of any two economic magnitudes are bound to be obscured by changes in other factors. In the case of the gold-price relationship some of the most important of these other factors, such as the substitution of gold for silver in reserves, the substitution of foreign exchange for gold, the spread of commercial banking, and changes in the extent to which currency is used as a means of saving, do not lend themselves to the kind of statistical measurement that would make possible the compilation of a multiple correlation. As we note below, a number of statistical studies of the relationship between changes in gold and changes in prices have been made, but the difficulties indicated are not solved in these studies; they are ignored or at best a rough allowance is made for them in gauging the extent to which the relationships observed in the past can be assumed to continue in the future. Hence, the results obtained can be significant only within a wide range of error; only a very great discrepancy between the prospective gold supply and that indicated by past experience as needful would justify the initiation of measures to ward off the danger.

CHAPTER II

GOLD AND PRICES BEFORE AND AFTER THE WAR

The earliest well-known study of the quantitative relationship between the gold supply and the price level was made by Professor Cassel of Sweden. Professor Cassel's estimate of the amount of gold needed to maintain stable prices was first published in English in 1923,¹ and he has elaborated the results of that study in numerous later publications. His results are summarized in Annex X of the *First Interim Report of the Gold Delegation* (1930). Calculations involving methodology similar to that employed by Professor Cassel have been made by Woytinsky,² Kitchin,³ Edie,⁴ and by Warren and Pearson.⁵

PRE-WAR GOLD-PRICE RELATIONSHIPS

Cassel. Professor Cassel takes 1850 and 1910 as reference dates at which the general level of prices was the same (Sauerbeck's index of wholesale prices being taken as the measure of the price level). He compares the world stock of gold at these two dates and finds that the

¹ *The Theory of Social Economy* (McCabe's translation), Vol. II, pp. 43⁸-54.

² W. Woytinsky, "Das Rätzel der langen Wellen," *Schmoller's Jahrbuch*, 1931, 55 Jahrgang, Heft IV, pp. 1-42.

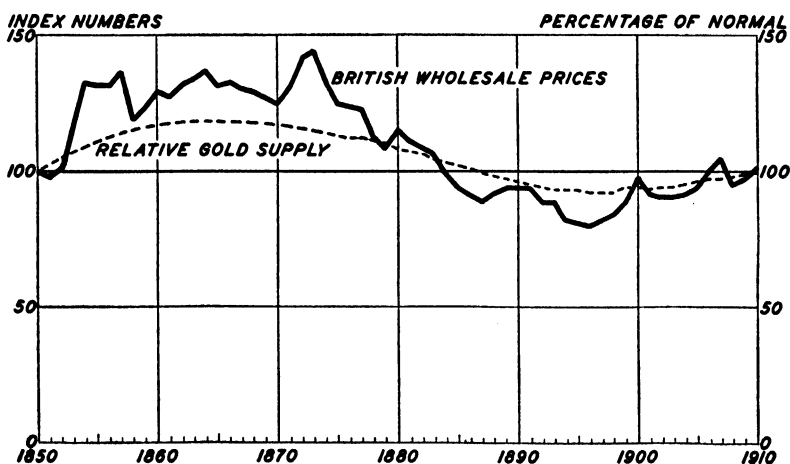
³ Testimony before the Macmillan Commission, *Minutes of Evidence*, 1930, Vol. I, pp. 82-93; *Evidence before the Royal Commission on Indian Currency and Finance*, 1926, Vol. III, pp. 519-39; *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, 1930, Annexes VII and XI.

⁴ Lionel D. Edie, *Gold Production and Prices before and after the World War*, 1928; *Capital, the Money Market and Gold*, 1929.

⁵ The author has discussed the Warren-Pearson estimates in *The Warren-Pearson Price Theory*, 1935, which is reprinted as Part II of this study.

average rate of increase in stock during the 60-year period was 2.8 per cent. He then computes what the stock would have been at the end of each intervening year if the increase had taken place in a uniform ratio. The

BRITISH WHOLESALE PRICES COMPARED WITH RELATIVE GOLD SUPPLY^a



^a Chart taken from *First Interim Report*, Annex X, p. 78; data from the same, pp. 77, 82-84.

By the relative gold supply is meant the ratio of the actual gold supply to a so-called normal stock. The latter is computed on the basis of a 2.8 per cent annual increase, the actual stock for 1850 and 1910 being taken as normal for those years.

actual stock of gold for each year is compared with this so-called normal stock, and the deviations of the actual stock from the normal stock are compared with the deviations of prices from the levels of 1850 and 1910. The results of this comparison are shown in the accompanying diagram.⁶

The general similarity between the long-time trends of the two curves is taken by Professor Cassell as evidence that during the period between 1850 and 1910

⁶ *First Interim Report*, Annex X, p. 78.

an annual increase of 2.8 per cent in the gold stock was sufficient to hold prices uniform (apart from cyclical fluctuations due to variations in the effective volume of means of payment other than gold). The major deviations of the price curve from the curve of the relative gold supply he explains by demand factors, as follows:

... The fact that the secular price level was above the relative stock of gold in the 'fifties and 'sixties, and below it in the 'nineties, suggests that certain secular variations occurred in the generally even development of the demand for gold. It is natural to assume that the gradual adoption of the gold standard after 1870 by nearly all countries should be reflected in the result that the growth of the demand for gold before 1870 was slower and after that year faster than the average growth during the whole period 1850-1910. The fall in the secular level of prices, which took place from about 1870 to about 1895, in excess of what would have corresponded to the fall of our curve for the relative stock of gold, is, according to this view, to be ascribed to the extraordinary demand for gold caused by the general adoption of the gold standard. However, the importance in this respect of European monetary reforms in the 'seventies has been much exaggerated. The demand for gold which was connected with this reform developed so gradually that it probably did not much exceed a normal growth in the demand. The gradual adoption of the gold standard on the European continent has therefore only had a comparatively small share in the depression of the secular level of prices. Another circumstance is without doubt primarily responsible for this depression, in so far as it superseded the simultaneous fall in the relative stock of gold. This circumstance is the enormous increase of the gold demand of the United States at the end of the 'seventies and the beginning of the 'eighties, due to the preparation for and subsequent realisation of the resumption of cash payment. The paper money of the Civil War was declared convertible from 1879 onwards. During the period from the middle of the year 1875 to the end of 1887, the monetary stock of gold of the United States of America rose from 89,000,000 dollars to 650,000,000 dollars, which is more than a sevenfold multiplication in twelve and a half years. The increase was particularly

great from the middle of 1876 to the end of 1881—namely, from 99,000,000 dollars to 485,000,000 dollars, or nearly a fivefold multiplication in five and a half years. These demands were made at a time when the world supply of gold was already so scanty that it was bound to lead to a material reduction of prices. The sum of 386,000,000 dollars, which the United States of America alone required for its monetary gold stock in the above-mentioned period of five and a half years, amounted to no less than 64 per cent of the world's gold production at the time. As under ordinary circumstances the remainder of the gold output would probably be required for non-monetary purposes, there was nothing left for the monetary requirements of the rest of the world. The value of gold was then bound to rise much higher than the smallness of production alone implied. In view of the rapidity of the economic development of the United States of America at that time, we may perhaps take as normal a doubling of the monetary demand for gold in twelve years. In addition to this, the United States of America required about 2 milliards of marks for monetary purposes in the period 1875-1887. The fall in the general price level caused by this extraordinary demand may be estimated at about 7 per cent.

A factor that acted in the same way on the side of the demand, though to a less extent, was the large imports of gold into India in the early 'eighties. The effect of this demand in reducing prices may perhaps be estimated at about 2 per cent.

These irregularities in the development of the demand for gold suffice to explain the depression of the general price level from the 'seventies to the 'nineties, so far as it exceeds the fall in the relative gold stock. Our conclusion must therefore be that the secular variations in the general level of prices are mainly due to variations in the relative gold stock, and for the rest to certain irregularities in the normally uniform increase in the demand for gold. This completes our analysis of the causes of the secular variations in the general price level, at least within the limits of statistical errors in our calculations.⁷

Professor Cassel adds 0.2 per cent as an allowance for loss from wear and tear, shipwreck, and other causes,

⁷ *First Interim Report*, pp. 74-75.

giving a round figure of 3 per cent as the addition to the world's gold stock necessary to maintain stable prices.

Cassel's work is worth careful study because of the great influence it has had upon monetary thinking, and because it seems impossible to make anything that can be called inductive study of the subject except by some modification of the method which he has used. However, as we shall see, his actual results are not acceptable, even as a first approximation of the probable need for gold under the operation of a gold standard similar to that which existed before the war.

Aside from the question whether the wholesale price level is the best test of adequacy, there is a fundamental difficulty in using Cassel's method to penetrate the future, a difficulty common to all inductive studies of long-time economic trends. This is the uncertainty as to the extent to which the experience of one century is a valid basis for forecasts concerning the next.

Cassel's method implies that on the average the increase in the amount of money needed to sustain a given price level in 1910 as compared with that which supported the same price level in 1850 is equal to the amount of "economic progress," that is, the increase in world production and trade. Other factors, such as the substitution of gold for silver, an increase of the use of bank deposits as money, and changes in the absorption of gold by India, are brought into Cassel's analysis to account for the major deviations of the price trend from the "relative supply of gold,"⁸ but no account is taken of the fact that the net change in these factors over the whole period is a factor determining the average increase of gold required to support a stable price level, just as

⁸ That is, the ratio of the actual supply to what it would have been if it had increased uniformly at its average rate of 2.8 per cent.

the fluctuation in them is a factor determining the deviations from the average. The legitimacy of extrapolating the rate of increase in gold stock observed to have been associated with an unchanged price level in the earlier period, depends not merely on the extent to which the rate of economic progress of those years can be projected forward, but also on the extent to which changes in these other factors can be expected to continue in the future at the average rate at which they went forward in the base period.

Cassel recognizes the influence of factors other than increasing production on the amount of gold required to maintain stable prices, but apparently gives them very little weight. He says:

. . . This does not of course in itself definitely prove that the general rate of economic progress has been exactly 2.8 per cent. It is always possible to argue that the economic development has involved demands on gold increasing more than proportionally to this development; the general introduction of the gold standard during the period could be quoted in support of such an assumption. On the other hand, reasons can be given for assuming the general economic progress to have been faster than the growth of the stock of gold—for instance, the growing use of cheques seems to give such an assumption a certain probability.

Independent investigations of the rate of economic progress of countries of European civilisation point in the direction that a rate of progress of about 3 per cent per year may be regarded as characteristic for the period in question; for the United States, the rate, of course, must be put considerably higher. An approximate idea of the world's rate of progress may be gained in the following way. In the period 1850-1907, the world's production of pig iron increased on an average by 4.2 per cent. Now, the growth of the iron industry may be regarded as characteristic of the whole industrial development of the world. The agricultural development has of course been much slower and may perhaps be put at the figure of 1.2 per cent per year,

which seems to correspond fairly well to the growth of the population and the improvement of its nourishment. If we assume that food represents a third of social income and that the other two thirds of this income have grown proportionally to the industrial development, we arrive at an average rate of progress of 3.2 per cent. If, on the other hand, we give the rates for food and industrial production the same weight in our calculation of the average progress, this average would be 2.7 per cent. This figure ought to be regarded as the lower limit for our estimate of the world's average economic progress. As it seems necessary to give the industrial production a somewhat higher weight than the agricultural, we stand on fairly solid ground if we reckon with a figure of round 3 per cent as characteristic of the economic development during the period 1850-1910.⁹

Obviously the figures for pig-iron production and the conjecture as to agricultural production are an inadequate basis for a quantitative conclusion as to the rate of general economic progress.¹⁰ Moreover, if, as Cassel believes, the increase in the amount of gold stock required to maintain prices during the 60 years before the war corresponded accurately or even approximately to the growth of production, it was because for the period as a whole these other important factors cancelled each other out. There is no reason to assume that they will continue to do so in a later period, especially since some of them are known to have reached their practical limits.¹¹

⁹ *First Interim Report*, p. 74.

¹⁰ Mlynarski uses data for coal, petroleum, copper, lead, zinc, tin, cotton, wool, and silk, in addition to pig iron, and gets an increase of only 3.6 per cent per annum. (F. Mlynarski, *The Functioning of the Gold Standard*, memorandum submitted to the Gold Delegation, 1931, p. 35.) Neither Cassel nor Mlynarski notes that the increase in the use of pig iron was due in large measure to the substitution of iron for wood and stone in construction; the expanded use of coal and petroleum was also largely a substitution for wood.

¹¹ Compare Hawtrey's remarks in regard to Kitchin's computations, published in *The International Gold Problem*, 1930, pp. 75-76.

Yet Cassel concludes: "If the rate of progress for the future is assumed to be the same as it was for the period 1850-1910, the stability of the present price level will depend on the possibility of the annual gold production's amounting to 3 per cent of the world's total stock of gold."¹²

Moreover, as Phinney has pointed out, one of the most important of these other factors, the changing relationship between the quantity of gold and the total quantity of money, is not explicitly recognized by Cassel at all.¹³ The total gold supply influences the monetary gold supply; the monetary gold supply is an increasingly important element in the total supply of standard money; the supply of standard money has a bearing on the total monetary supply. As we pass from

¹² *First Interim Report*, p. 74. The sentence quoted should be read in the light of the preceding one: "If no further alterations are made in the monetary use of gold, the stability of the new price level will depend on the possibility of such a production of gold as will keep pace with the general economic progress." This statement is formally correct if the phrase "further alterations in the monetary use of gold" is interpreted broadly enough to cover not only changes in monetary institutions, but also any further spread of banking and any change that may occur in the practice of business firms and private individuals with respect to the holding of money and bank deposits as reserve purchasing power. But is there any more reason to project forward the past trend of production than the past trend of growth of credit?

¹³ J. T. Phinney, "Gold Production and the Price Level: The Cassel Three Per Cent Estimate," *Quarterly Journal of Economics*, 1933, Vol. 47, pp. 647-79. For countries for which data on currency and bank deposits are available, the ratio of gold to credit currency displayed large changes during the period covered by Cassel's computations. Edie calculates that in the United States the ratio of gold stock of different bank deposits plus money of all kinds fell from 12.1 per cent in 1882 to 8.8 per cent in 1913, while in England the ratio of the gold in the Bank of England to all deposits and notes fell from 40.9 per cent in 1882 to 34.6 per cent in 1913. (*Gold Production and Prices*, pp. 78-79.) For eleven leading countries the ratio of gold stock to note issue plus deposits of central banks fell from 81.7 per cent in 1913 to 13.4 per cent in 1925 (computed from Edie's data given on p. 81 of the publication just referred to). Including Russian data the ratios were 82.5 per cent for 1913 and 12.8 per cent for 1925.

the world gold supply to the world's monetary gold supply, and thence to the world's supply of monetary reserve and thence to the total volume of monetary media, we get nearer and nearer to what is sought; namely, a supply factor to compare with the growth of the demand for money at a stable price level, though even the total figure for all money (coin, currency, and bank deposits) is an imperfect measure of the supply of monetary media, since there are variations in the extent to which the money is used as an instrument of saving in addition to its use as the means of making payments.

A valid criticism of Cassel's method has been offered by Woytinsky¹⁴ and by Phinney.¹⁵ They point out that while Cassel's work has to do with price trends he has used actual price averages, not trend values, for 1850 and 1910 to establish equality of the "general level of prices" at those dates. In fact, the 1850 prices were those of a cyclical depression and much of the rise generally attributed to the increased gold supply appears to have been nothing but a cyclical upswing which culminated in 1857.¹⁶

Kitchin and Edie have refined Cassel's method by working with monetary gold instead of total gold; Mlynarski and Wilcoxon have refined it still further by working with total monetary metal (gold and silver) instead of gold alone. Kitchin's results have been accepted by the Royal Commission on Indian Currency and Finance, the Gold Delegation, the Macmillan Committee, and in most other discussions of the question. We shall therefore consider them next.

Kitchin. Kitchin's method is like Cassel's except that

¹⁴ Article cited on p. 18.

¹⁵ Article cited on p. 25.

¹⁶ Compare pp. 190-93.

in place of total gold stock he uses the total stock of gold money.¹⁷ The data used are his own estimates, made by assuming a stock of 200 million pounds sterling at the end of 1843 and adding to it each year the balance remaining after deducting the estimated industrial consumption of Europe and America, and the absorption of Egypt, India, and China. The annual rate of increase of monetary gold stock from 1850 to 1910 is figured at 3.1 per cent, which may be compared with Cassel's figure of 2.8 per cent.¹⁸

Kitchin's method is preferable in that a comparison of monetary gold with prices gets us a little closer to reality than does a comparison of total gold with prices. But the data are less reliable, because they are residuals obtained by subtracting the one set of estimates from another set, and the percentage error in residuals is larger than that in the two series taken separately. Kitchin's results contain all the error that there is in Cassel's estimates of total supply, plus the error in his estimates of industrial consumption; and data on gold consumption even for recent years are notoriously bad.

It has not seemed worth while to try to refine Kitchin's estimate of 200 million pounds as the world's monetary gold stock in 1850, but on the basis of investigations made by several scholars we conclude that Kitch-

¹⁷ Gold in circulation and gold in central banks are counted alike as gold money, without any weighting for the greater capacity of gold in central banks to support credit currency.

¹⁸ Kitchin makes no deduction for wear and tear, which is probably negligible. The fair agreement between the two figures reflects the fact that the ratio of Kitchin's figure for gold money to Cassel's figure for total gold remains fairly stable, except for 1850-60. For 1850 the proportion was 47 per cent; it rose by 1860 to 57 per cent. It declined gradually to a low of 51 per cent in 1890; and rose again to 57 per cent by 1910. The difference between Kitchin's annual ratio of 3.1 per cent and Cassel's figure of 2.8 per cent is chiefly due, therefore, to the fact that monetary gold increased much faster than total gold in the decade of the fifties.

in's estimate of monetary gold for 1913 is roughly a billion dollars too low.¹⁹ If we accept his figure for 1850, this correction results in a growth requirement of 3.3 per cent instead of Kitchin's figure of 3.1 per cent.²⁰

Moreover, aside from the accuracy of data, the task of applying Kitchin's results to the future is more complicated than is the application of Cassel's method, for it is necessary to forecast not merely gold output, but also industrial consumption and Oriental absorption. The difficulties connected with these items are evaded under the Cassel method by the implicit assumption that the disturbing effects of changes will continue to cancel out as they are assumed to have cancelled out in the past. Finally, Kitchin's correlations suggest the question of whether they reflect an adaptation of the price level to the monetary gold supply, or a tendency for the proportion of gold that goes into money to be adjusted to the needs of the price level. Certainly the banks are not entirely passive; the volume of gold that they seek to attract cannot be entirely independent of the volume of loans, which in turn is affected by the price level.

Warren and Pearson. The methods used by Professors Warren and Pearson are similar to those used by Kitchin. They are discussed in detail in Part II: a considerable part of what is said there is applicable to the Kitchin analysis also.

Edie. Edie's method is essentially the same as Kitchin's, but he has made independent estimates of the data for recent years and has given much more attention than did his predecessors to actual working of factors making

¹⁹ For discussion see Appendix C, p. 205.

²⁰ For discussion of Woytinsky's technical refinement of Cassel's and of Kitchin's results, compare Appendix B, p. 202.

for change in the amount of gold needed to support a given amount of currency. For the pre-war period Edie accepts Kitchin's results. However, he attaches more weight than does Kitchin to the fact that the later pre-war years indicate a lower gold requirement than the earlier years. Kitchin found for 1851-84 a requirement of 3.09 and for 1844-80, 3.29; whereas for 1884-1907 he found a requirement of 2.91, and for 1880-1913, 2.76. Because of this tapering off, Edie uses 2.7 as the normal rate of increase under late pre-war conditions instead of Kitchin's rate of 3.1, which is an average for 1850-1910.²¹

The decline in the normal secular rate of increases before the war is attributed by Edie chiefly to the fact that every dollar of gold supported a greater volume of notes and deposits in the later pre-war years than it did in the middle of the nineteenth century.²² A further sharp decrease in gold requirements was effected during and just after the war by concentrating gold in central reserves, by the introduction of gold exchange standards, and to a slight extent by the establishment of still lower reserve ratios, so that for 1913-25 the rate of increase of world monetary gold associated with the secular stability of prices, as calculated by Edie, was about 2.0 per cent. Since there was no prospect that further material economies could be effected by these means, Edie concluded that the future normal annual increase would be about 2.7 per cent, but that that rate was applicable to a principal sum about one-third less than what would be re-

²¹ *Gold Production and Prices*, p. 55. It is to be noted that these growth figures are based on Kitchin's estimate of the gold stock for 1913, not on Edie's higher figure, which was published later in *Capital, the Money Market and Gold*.

²² Compare note 13 on p. 25.

quired if gold were to be returned to circulation in the pre-war proportions.²³

The writers so far discussed confined their attention to gold money, making no allowance for changes in the monetary supply of silver, although during the first part of the period under observation the silver standard was more general than the gold standard, while gold was rapidly substituted for silver after 1870. Computations of the combined gold and silver supply associated with stable prices have been made independently by Mlynarski²⁴ and by Wilcoxon.²⁵

Wilcoxon. L. C. Wilcoxon, working with data for combined monetary stocks of gold and silver, got 1.414 per cent for 1804-1924 as the increment necessary to maintain stable prices, and 0.72 per cent for 1869-1924.²⁶ Using gold only, the increment required, according to his computations, works out at 2.65 per cent for the entire period, and 2.8 per cent for the latter half. Wilcoxon finds, however that the correlation of prices with the stocks of metals is closer when silver is included in the computation than it is when gold alone is utilized. Wilcoxon's results seem to indicate clearly (a) that the amount of metallic money actually required in the nineteenth century to support prices was much lower than the figure generally taken on the basis of Cassel's or Kitchin's researches, and (b) that the demand for precious metal money to maintain the price levels of the world decreased to a remarkable extent during the nineteenth century and the first quarter of the twentieth. Concerning this drop in the ratio he says:

²³ *Gold Production and Prices*, p. 128.

²⁴ Mlynarski, *The Functioning of the Gold Standard*, Chap. III.

²⁵ L. C. Wilcoxon, "World Prices and the Precious Metals," *Journal of the American Statistical Association*, Vol. 27, 1932, pp. 129-40.

²⁶ The same, pp. 139-40.

... This is extremely important as it shows the demand for the precious metal money to maintain the price levels of the world has decreased to a remarkable extent during the last century and a quarter. It is needless to remark that the same influence may be carried still further.

Since Wilcoxon's second period included the years of the World War and the post-war inflation, when gold production was at a minimum and the volume of credit pyramided on it was at a maximum, it is not strange that he found a lower rate of increase necessary for the later than for the earlier period. This does not of itself justify his projection forward of a tendency to a declining demand for the precious metal.²⁷

Mlynarski. Mlynarski's figure for the average yearly increase of gold and silver combined for 1850-1910 is 0.78 per cent.²⁸ He uses monetary gold plus *total* silver for 1850 and monetary gold plus *monetary* silver for 1910. He defends this apparent discrepancy on the ground that in 1850 there was free coinage of silver, so that all silver not in demand as a commodity went automatically into the currency, whereas by 1910 silver had generally been demonetized and played only an incidental part in the world's reserves. This procedure seems somewhat arbitrary, especially since the reasoning applied to silver for 1850 would apply to gold for both dates. We therefore prefer Wilcoxon's method, under

²⁷ Compare above, p. 29.

²⁸ Mlynarski suggests that the logic of Kitchin's method would call for the inclusion also of stocks of foreign exchange held in the reserves of central banks. But an addition of the foreign exchange reserves of the world is not equivalent to the addition of the same amount of gold, first, because gold reserves have to be held against them so that the addition of exchange reserve to gold reserves would involve double counting; second, because the presence of foreign gold exchange reserves in the money market of a gold standard country makes it necessary for the central bank of that country to carry an otherwise excessive cushion of surplus reserves in order to be prepared to meet withdrawals.

which the computations are based on monetary stocks for both dates.

However, Wilcoxon's results are not directly comparable with those of Cassel and Kitchin, because he has used different dates. In order to secure a better comparison we have computed from Wilcoxon's data (page 136) the rate of increase of combined gold and silver monetary stocks for 1849-1909, which is approximately the period covered by Cassel's and Kitchin's studies. For this period, monetary stocks of gold and silver grew at the rate of 1.46 per cent per annum. We believe this figure to be a safer approximation to the amount of monetary metal required to maintain the prices included in Sauerbeck's index during those years than either Cassel's or Kitchin's figure on the one hand, or Wilcoxon's or Mlynarski's on the other.

POST-WAR GOLD-PRICE RELATIONSHIPS

The prospective adequacy of the gold supply involves two subordinate questions: the amount of circulating medium needed to meet the requirements, and the amount of gold needed to support that amount of currency. Because of the lack of data concerning the growth of credit money in the pre-war era, we have had to confine our attention to the statistical relationship between the underlying gold stock and the price level, but with regard to the post-war years we can advantageously examine general money growth and requirements as well as gold supply.

1913-28. Between 1913 and 1928 the amount of gold required to support the world's monetary systems was changed in several respects, among which were: (a) the withdrawal of gold coin from circulation in most countries; (b) the limitation of redemption of several lead-

ing currencies to comparatively large units (400 ounces in the case of France and Great Britain), redemption being effected by the use of gold bars suitable for international shipment, but not for individual hoarding or general circulation; (c) a great increase in the popularity of the gold exchange standard; (d) a reduction in the average ratio of monetary gold to the total amount of monetary media (including bank deposits).

The Gold Delegation's figures indicate that from 1913 to 1928 there was an increase in monetary gold stock of 1.5 per cent per annum, and in notes and sight liabilities of central banks of 6 per cent. As gold prices rose between 1913 and 1928, a growth requirement for gold of much less than the pre-war figure is indicated. It would not be safe, however, to estimate future gold requirements on the assumption that the experience of 1913-28 indicates a trend which can be projected over the future. The withdrawal of monetary gold from circulation and its concentration in central banks has taken place once for all, and the increase required to maintain stable prices while this change was taking place is no index of the increase that is required after the change has been completed. The economy effected by the introduction of the gold-exchange standard also has definite limits which probably had been approximated by 1929. Hence any future growth of total money stock will presumably require a larger proportionate growth in the monetary gold stock than was the case during the war and the early post-war eras. Edie concludes that the pre-war experience, rather than the abnormal experience of 1913-28, should be followed in reaching a judgment as to future needs. The writer agrees that if statistical comparisons of gold supply and price movements are to be used at all, the experience of these years when gold was being

converted from a direct medium of exchange into reserve material ought to be given little weight.

1929-35. The experience of the depression years throws no light on the probable long-run relationship of the size of the gold stock and the level of prices. As is shown in detail in Chapter V, both the total world gold stock and the monetary gold stock have increased enormously, while prices, though they have recovered somewhat from the low levels of 1932, are still materially below those of 1925-28.

The prospective need for monetary gold. The prospective requirements for gold reserves were analyzed for the Gold Delegation by Loveday on the alternative assumptions of a 2 per cent and a 3 per cent increase in the need for money,²⁹ and his findings may form the starting point of our discussion.

Loveday took account of the following determinants of the amount of gold needed to support a given amount of currency in the world: (a) the legal obligation placed upon central banks to hold gold reserves; (b) the cushion of gold reserves over and above legal requirements normally held to meet the calls for gold for export; (c) the customary practice of those banks which are permitted to hold either gold or foreign exchange; (d) the composition of the currency—particularly the use of gold coin and the relative importance of checks and notes; (e) the distribution of monetary gold. We shall consider in this section the first four of these items, deferring the question of distribution to Chapter VII.

The average legal requirement for gold reserve, prior to the general suspension of gold redemption, was approximately 32 per cent; for convenience a ratio

²⁹ A. Loveday, "Gold: Supply and Demand," *First Interim Report*, pp. 88-120.

of 33 per cent was assumed by Loveday as a basis for computation of the adequacy of the supply. The normal cushion over and above legal requirements was taken as 7 per cent. This gives a figure of 40 per cent as the normal requirement for gold reserves of central banks against notes and demand deposits.³⁰ It should be noted that the 7 per cent figure is merely an average of existing margins: the figures for different countries vary so widely that the average has little significance as an indication of what is considered a safe "cushion." The average reserve of central banks in 1925 was 40.9 per cent; in 1927, 39.9 per cent; and in 1928, 40.7 per cent.³¹

The point as to the inclusion of foreign exchange in central reserves refers to the practice of countries operating under the so-called gold-exchange standard, under which part of a country's central reserve may, at the discretion of the central bank, be kept on deposit in banks of other countries, or invested in short-term paper which is payable in foreign gold standard currencies. For such countries the gold requirement is computed by Loveday under three alternative assumptions: first, that the entire legal reserve is kept in gold; second, that the 1929 proportion of gold to other legal reserve assets is considered as normal for the future; and third, that foreign assets are held to the maximum permitted by law.³²

³⁰ It is perhaps worth repeating that the assumption made for purposes of analysis, that there will be no change in legal reserve requirements such as would materially change the volume of gold required to support a given volume of currency in the world at large, does not imply that significant changes in monetary laws are improbable, or undesirable. (Compare p. 11.)

³¹ A few minor countries were omitted from the computation.

³² For countries like Great Britain where a fixed limit is set to the circulation of notes not covered by gold, Loveday assumed that the existing reserve percentage would be maintained in the future.

On the first hypothesis, the world gold requirement was computed as 34.4 per cent of total demand liabilities; on the second hypothesis, 31.7 per cent; and on the third hypothesis, 29.0 per cent.³³ The most significant figures are probably those based on the second hypothesis, that is, that for each country in 1929 the division of central reserves between gold and other assets could be regarded as normal. Certainly neither of the extreme figures could be regarded as a sound basis for an estimate, though the unfavorable experience of central banks with their deposits in other countries in 1931-33 may foreshadow a lessened willingness to hold foreign currency reserves in the future.

With regard to the composition of the currency, Loveday's working assumptions were that the gold which had been withdrawn from circulation in almost all countries would not be reintroduced as a medium of exchange, and that on the other hand no considerable further additions to the world's centralized gold reserves through withdrawal from circulation could be expected. This conclusion has to be modified in the light of the withdrawal from circulation of gold and gold certificates in the United States, which has made available for reserve purposes about 550 million dollars of gold hitherto held against gold certificates, and 375 million formerly in banks and in private hands.³⁴

The other important point in regard to the composition of the currency is the proportion of notes to de-

³³ *First Interim Report*, p. 96.

³⁴ Figures obtained by a comparison of estimated circulation of gold and gold certificates for November 1928 and July 1935, *Federal Reserve Bulletin* monthly statements. The figure for gold certificates is the difference between the 100 per cent backing required for certificates and the 40 per cent reserve required against notes.

posits.³⁵ In English-speaking countries the use of checks has expanded to the point where further changes in this direction are not likely to be important, but in continental countries there is a possibility of a significant development along the line which monetary evolution in the British Empire and in America has already taken. Such a change would be significant because of the general practice of requiring much larger ultimate reserves against notes than against deposits.³⁶

On the basis of the Loveday analysis summarized above, the Gold Delegation drew up estimates of the prospective increment of gold that would be needed to maintain 33 per cent and 40 per cent reserves, on the

³⁵ For criticism of a minor point in Loveday's analysis of this relationship, see Appendix B, p. 200.

³⁶ This rather illogical distinction arises in practice from the fact that bank notes are chiefly the direct obligation of the central banking agency, which holds against them reserves approximating those which it holds against deposits, while the bulk of the deposits owned by the public are the liabilities of commercial banks whose reserves are the notes of the central bank or deposit credits on its books. Thus the deposit currency (except a small amount of private deposits held by central banks) is only indirectly supported by the gold base; the reserve of the commercial banks consists of the liabilities of the central bank; the gold stock is the reserve against these central bank liabilities. Given this institutional situation, a change in the disposition of the public to hold its unspent balances in deposits rather than in notes may change the amount of gold needed to support a given amount of the actual monetary medium. For example, in the fall of 1931 there occurred in the United States a wave of conversion of bank deposits into notes. The notes had to be covered by a 35 per cent reserve, whereas the deposits that were cancelled in this process had required a gold backing of about 4 per cent (40 per cent reserve as against bankers' deposits in the Federal Reserve Banks which served 7, 10, or 13 per cent reserves of the commercial banks). As a result, the Reserve Banks' liabilities rose in five months enough to reduce the reserve ratio of the Reserve Banks from 83 per cent to 75 per cent, between June 30 and November 30. The actual decline of the ratio was greater than that because there occurred at the same time a large outflow of gold. The ratios given in the text are computed by comparing the gold reserve held on June 30 with the total of notes in circulation and member bank reserve deposits on the respective dates.

alternative assumptions of a 2 per cent and a 3 per cent growth requirement. A 2 per cent growth requirement which, as was shown above, is in line with our interpretation of nineteenth century experience, worked out, on the basis of a 33 per cent cover for average increases in notes and sight liabilities, at 167 million dollars for 1930 and rose to 204 million by 1940. In this calculation the existing surplus above 33 per cent was assumed to remain unchanged in absolute amount. To maintain 40 per cent cover, the 2 per cent growth requirement worked out at 200 million for 1930, rising to 244 million by 1940. To provide 33 per cent reserves for the 3 per cent growth called for by Kitchin's calculations, the necessary annual increment would rise from 253 million in 1930 to 340 million in 1940, and for 40 per cent reserves from 303 million to 408 million.

CONCLUSION

For reasons which were indicated on pages 33 and 34, our inductive conclusions as to the normal relationship of the quantity of gold to the level of prices have to be based on pre-war rather than recent experience. The principal difference between the estimates which we have discussed relates to the treatment of the silver stock, and on this point the weight of the argument favors the inclusion of silver in the computations. The gold price level and the silver price level were tied together during the first part of the period by the operation of the bimetallic standard, chiefly in France, and with the abandonment of bimetallism and the silver standard and the gradual elimination of silver from central reserves an extra load was thrown on the gold supply. The gold-price ratio is therefore not a fair measure of the normal relationship between gold and prices under the gold

standard. The effective monetary reserve was the combined stock of gold and silver.

We therefore tentatively suggest 1.5 per cent per annum as our best approximation of the amount of new monetary metal required under nineteenth century conditions to maintain stable prices, which means here the prevention of either a long-term decline or a long-term advance in wholesale prices of the type represented in the Jevons-Sauerbeck index. The rate of growth was apparently less than the growth of production and trade, the ratio being held down by the steadily increasing use of bank deposits and the substitution of other investments for money as instruments of saving. This trend toward an economy of gold may be expected to continue, but probably at a declining rate. It would be safer, therefore, to figure on a somewhat higher growth requirement for the future if economic progress goes on as rapidly as in the nineteenth century. The 3 per cent rate, however, is evidently much too high; 2 per cent is a reasonable compromise. We shall use this figure in our estimates of the need for money to maintain stable wholesale prices, bearing in mind, however, that its accuracy, like that of any other figure which might be used, depends more on the reasonableness of the assumptions than on the weight of historical evidence.

As is shown below, the Delegation's estimate of the amount of new gold to be available for monetary purposes was 224 million for 1930, declining to 170 million by 1940. According to these calculations the margin of safety was already close and a deficiency was definitely in prospect before 1940. In order to test the validity of this conclusion it is necessary to appraise the validity of the estimates of future supply. This we do in Chapter III.

It is to be emphasized that this conclusion relates to the feasibility of re-establishing a gold standard of the pre-war and pre-depression type in which the credit policy of central banks was restricted by gold reserves; it has little or no relevance to the situation which will exist if monetary authorities in the future are given such wide discretion and such large powers that the gold reserve does not regain its effectiveness as a limit on credit expansion.

CHAPTER III

THE PRODUCTION OF NEW GOLD

Gold has been found scattered over practically the entire world, except for the areas around the two poles, which have not as yet been seriously prospected. It is estimated that since 1492 approximately 1,124,355,000 ounces of gold, valued at \$23,205,675,122, have been taken from the earth.¹ The present world stock, if we accept Cassel's very dubious allowance of 0.2 per cent for what has been worn out and lost, is estimated at \$21,439,000,000. If this gold were lumped together in the shape of a cube, the cube would measure only 39 feet on each side.

The only important source of gold is that constituted by gold deposits in the earth. These are of three general types—alluvial, quartz reefs, and banket. The alluvial or placer deposits are masses of earth or sand, often in the beds of streams, which contain the débris of eroded reefs of gold-bearing quartz. Gold is secured from these deposits by washing out the mud, water, stones, and other impurities. Placer deposits formerly accounted for the greater part of the gold production, but in recent years the percentage of gold derived from this source has declined to little more than 5 per cent of the total

¹ Figure derived from Lexis' estimate for 1850, 10 billion gold marks or \$2,382,000,000. Del Mar's estimate for 1850 was only \$2,000,000,000. Del Mar arrives at this figure from estimates of King, Humboldt, Jacob, Tooke, Newmarch, and others. The use of Del Mar's figure would make comparatively little difference in the estimate for recent years. For a good history and description of early gold production see Alex Del Mar, *History of Precious Metals*, New York, 1902, 2d ed., rev.; also see William Jacob, *An Historical Inquiry into the Production and Consumption of Precious Metals*, 2 vols., Murray, London, 1831.

supply.² The largest share of the annual production comes from veins of quartz. Some of these are worked primarily for gold; in others the gold is a minor element of value, being a by-product from the refining of ores of lead, silver, zinc, and copper. In the United States down to 1930, more and more gold was being produced as a by-product of mines producing other metals, but on account of the low prices of the other metals this type of production has since declined. In South Africa, which within a few hundred square miles now produces nearly 40 per cent of the world's total, gold is obtained from *banket*, a unique rock structure formed by the consolidation of alluvial deposits.

PAST PRODUCTION OF GOLD

Since 1492 there have been three major periods of great increase in gold production, as the following table shows:

WORLD PRODUCTION OF GOLD^a
(Annual averages in thousands of fine ounces)

Period	Production	Period	Production
1831-40.....	652	1886-90.....	5,461
1841-50.....	1,761	1891-95.....	7,883
1851-55.....	6,410	1896-1900....	12,447
1856-60.....	6,486	1901-05.....	15,607
1861-65.....	5,950	1906-10.....	20,972
1866-70.....	6,270	1911-15.....	22,259
1871-75.....	5,591	1916-20.....	18,964
1876-80.....	5,543	1921-25.....	17,455
1881-85.....	4,795	1926-30.....	19,763
		1931-34.....	24,873

^a Compiled from reports of the Director of the U.S. Mint.

The first great increase in the supply of gold was in the years directly following 1848, and was due to the

² It is interesting to read a prediction made in 1877 by a Viennese geologist, Edward Suess, that gold mining had no future since alluvial deposits which supplied almost all of the gold were being rapidly exhausted. See Karl Helfferich, *Money*, translated by Louis Infield, New York, 1927, p. 96.

discovery of gold in Australia and California. The second came after 1890, as a result of discoveries in South Africa and Alaska and also as a result of improved methods of mining and refining, the most important of which was the introduction of the cyanide process. The peak was reached in the year 1915, when 22,718,154 fine ounces of gold were produced.

During the war and afterward, gold production declined until 1922. This decline was a result mainly of disorganized conditions caused by the war, high prices, and later, labor troubles in South Africa. Since 1922, a third major upswing in gold production has occurred, as is shown by the following figures.³ The data are in thousands of fine ounces.

1929	19,673	1932	24,266
1930	20,722	1933	25,514
1931	22,371	1934	27,339

ESTIMATES OF FUTURE GOLD PRODUCTION

In most current discussion of the adequacy of the gold supply it is assumed that the prospect is for a considerable decline in the world output of gold within the near future, at least if the pre-depression price level is restored. The Gold Delegation in its *First Interim Report* presented two forecasts of the production of gold, one compiled by Joseph Kitchin and the other by the staff of the Delegation on the basis of official or semi-official estimates furnished by representatives of the principal producing countries. The two sets of estimates are given in the table on page 44.

The so-called official estimate forecast an output of 405 million dollars in 1930, rising to 407 million in 1932, then declining to 314 million in 1940. Kitchin's estimate rises from 404 million dollars for 1930 to 410

³ *Yearbook of American Bureau of Metal Statistics*, 1934, p. 89.

million for 1932, and declines to 370 million for 1940. The difference between the two estimates is due chiefly to a slower rate of decline which Kitchin forecast for the

ESTIMATES OF THE FUTURE PRODUCTION OF GOLD^a
(In millions of dollars of 1929 gold content)

1. Estimate by the Gold Delegation

Year	South Africa	Canada	United States	Australia	India	Others	World Total
1930..	211.7	40.3	42.8	11.2	7.6	91	405
1931..	207.3	40.9	42.2	12.4	7.5	91	401
1932..	213.2	41.5	41.5	12.2	7.4	91	407
1933..	206.8	42.1	41.0	11.9	7.3	90	399
1934..	198.1	42.8	40.3	11.7	7.3	90	390
1935..	189.8	43.4	38.9	11.4	7.2	90	381
1936..	166.7	44.0	37.3	11.2	7.1	90	356
1937..	167.4	44.7	36.7	10.9	7.0	90	357
1938..	167.4	45.3	36.5	10.7	7.0	90	357
1939..	133.3	45.9	36.3	10.5	6.9	90	323
1940..	124.1	46.5	36.1	10.2	6.8	90	314

2. Estimate by Kitchin

Year	Transvaal	Canada	Rest of Empire	Total British Empire	United States	Russia	Rest of World	World Total
1929..	215.6	39.4	35.0	290.0	44.3	24.3	47.7	406.3
1930..	212.1	40.9	34.1	287.1	43.3	25.3	48.7	404.4
1931..	209.2	42.3	33.1	284.6	42.3	26.3	48.7	401.9
1932..	217.0	43.8	23.1	292.9	41.4	27.2	48.7	310.2
1933..	213.1	45.3	31.1	289.5	40.4	28.2	48.7	406.8
1934..	208.7	46.7	30.2	285.6	39.4	29.2	48.7	402.9
1935..	203.4	48.2	29.2	280.8	38.4	30.2	48.7	398.1
1936..	201.5	49.6	28.2	279.3	37.5	31.1	48.7	396.6
1937..	196.1	51.1	27.2	274.4	36.5	32.1	48.7	391.7
1938..	187.8	52.6	26.3	266.7	35.5	33.1	48.7	384.0
1939..	173.2	54.0	25.3	252.5	34.5	34.1	48.7	369.8
1940..	172.7	55.5	24.3	252.5	33.6	35.0	48.7	369.8

^a *First Interim Report of the Financial Committee of the Gold Delegation*, League of Nations, 1930, pp. 12 and 60 respectively. Data converted from pounds to dollars at \$4.866.

Transvaal, concerning which he had much more intimate knowledge than he claimed for the rest of the world. The official figures and those submitted by Kitchin were accepted by the Gold Delegation as fixing the upper and lower limits of a reasonable forecast.

SOUTH AFRICA

General pessimism concerning the outlook for world gold production was due chiefly to conditions believed to exist in the Transvaal, which at that time accounted for nearly one-half the world's output.⁴

Such pessimism was inspired, to a considerable extent, by a special report of R. N. Kotze, government mining engineer of the Union of South Africa, submitted in 1925.⁵ This report stated that 49 mines had accounted for 99 per cent of the output of the Transvaal during 1924, of which two had already ceased operations and four had not yet had their official lives determined (for purposes of taxation). These six mines were small. The lives of the other 43 mines were forecast as follows:

Official Life	Number of Mines	Capacity in Tons
Less than five years	19	6,620,000
5 to 10 years	11	7,078,000
10 to 15 years	7	9,772,000
15 to 20 years	4	3,894,000
20 to 30 years	2	1,228,000

On this basis it was calculated that the crushing capacity would suffer a 23 per cent reduction after 5 years; a 48 per cent reduction after 10 years; and an 82 per cent reduction after 15 years, or by 1940.

⁴ Thus H. A. Kursell, resident engineer in New York City of the American Smelting and Refining Company, said in 1930: "Nevertheless, it may not be amiss to point out that the opening up of a few new large mines, be they even another Lena Goldfields (500,000 oz. per annum), or a second Hollinger (450,000 oz. per annum) or Homestake (300,000 oz. per annum), would not appreciably alter the picture of the future outlook for world gold production, which is controlled by the output of the Rand." (Report originally prepared for the American Smelting and Refining Company, and published as Annex VIII of the *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, 1930, p. 65.)

⁵ *Report on the Far East Rand by the Government Mining Engineer*, Union of South Africa, Cape Town, 1925.

Kotze pointed out, however, that these figures understated the probable economic life of the area, for two reasons: first, no allowance was made for new mines (only two have come into operation since); and second, "the lives of mines are always conservatively estimated for purposes of income tax, and in actual practice are found to be longer than forecasted unless the mine comes to an untimely end owing to inability to make profits." On the other hand, allowance was not made for possible increases in the crushing capacity of existing mines, which would temporarily slow down the rate of decline but would hasten the rate of exhaustion of the ore reserves. It was estimated, therefore, that even if no new producers entered the list, the reductions of 23 per cent and 48 per cent forecast for 1930 and 1935 would actually occur about two years later than the figures shown.

Four years after the official estimate just cited was prepared, Kotze's successor, Dr. H. Pirow, submitted a memorandum concerning it to the South African Parliament.⁶ It is evident that Pirow considered his predecessor's estimate a gross understatement of the probable lives of the mines, and was somewhat embarrassed in dealing with it. He pointed out the following conditions as "factors which tend to prevent a reduction in the gold output": (1) between 1925 and 1927 the prospects for concluding satisfactory lease contracts for new mines had changed for the better; (2) exploratory work in the Sub-Nigel area had shown that the "shoots" not only continued in depth but were widening out and were showing up more promisingly; (3) market conditions for obtaining capital for development and for new mines had improved.

⁶ Reprinted in *First Interim Report*, pp. 24-35.

Second, there had already occurred a reduction in working cost per ton milled from 19s. 5d. in 1924, to 18s. 4d. in 1926, and in costs per fine ounce of gold from 46s. 11d. to 44s. 11d. This may seem to be a small reduction, but Dr. Pirow stated that a further reduction of 2 shillings per ton would maintain output at its existing level for ten or twelve years.⁷ Since the official estimate called for a reduction in ten or twelve years of more than 40 per cent in the South African output, it is clear that an estimate based on the assumption of no reduction in costs was an extremely hazardous basis for forecasting a significant curtailment of the supply of new gold.

In fact, changes were taking place in the technique of mining operations which foreshadowed further reductions in cost. Pirow said: "The successful carrying on of stoping operations on a width of less than two feet is therefore another obvious indication that the gold output of the Witwatersrand will not suffer the reduction which the figure based on the official lives of existing mines only would lead one to regard as threatening in the near future." To be sure, Dr. Pirow also referred to certain factors which operate toward a shrinkage of production, but a careful reading of his memorandum indicates that these factors are either entirely hypothetical (a rise in working costs, shortage of European or native labor, industrial upheavals, lack of capital) or else are such as must already have been taken into consideration (the increased depth of mine workings). Pirow's conclusion was that "the indications pointing to a prolongation of

⁷ He also said: "Every 6 pence increase in the cost per ton milled represents a reduction of many thousands of tons of ore in the total tonnage available for extraction" (p. 33). If this is true, the converse must also be true.

the level of the gold industry considerably beyond the periods shown by the table of official lives of existing mines are most favorable."

It is our conclusion, both from Pirow's report and from later developments, that Kotze's qualification of the official data, to the effect that lives of mines are always conservatively estimated for income tax, and his forecast that the reduction will occur "a couple of years later than the figures show," greatly understate the downward bias in the data which pointed to an early exhaustion of the mines. Some inkling of the extent of this bias may be gained from an examination of the experience of the five years following 1924, a period when the mining industry of South Africa did not benefit from any extraordinary stimulus. For 1929 Kotze estimated that the tonnage capacity of the mines existing in 1924 would be 21,972,000 tons. The amount actually crushed in 1929 (which was not a capacity year) was 30,502,800 tons—and no new mines had come into operation.

Kitchin's forecast of the decline to occur between 1930 and 1940 amounts to less than 8 per cent, as compared with the "official" estimate of 41.4 per cent. The Gold Delegation therefore assumed, as has generally been assumed since by students of the question, that Kitchin's estimate of the probable decline was conservative. However, when instead of contrasting Kitchin's figures with the official estimate we examine his previous forecasting record, it appears that his methods also yield estimates that are biased downward. The earliest Kitchin estimate which we have examined was published in 1921.⁸ In this paper he forecast the Transvaal output for 1923 as about 30 million pounds sterling; the actual output for

⁸ Joseph Kitchin, "The Position of Gold," *Review of Economic Statistics*, Supplements and Advance Letters, July 25, 1921, pp. 257-63.

that year was 37.9 million. In 1921 he forecast 24 million pounds for 1930; in 1924, on the basis of the more favorable results that were being obtained, he raised the estimate for 1930 to 29 million pounds;⁹ in 1926 he raised it again to 35 million pounds.¹⁰ The actual output for 1930 was 44.4 million pounds, or nearly double what Kitchin had forecast nine years before. Instead of a 30 per cent decline in the decade of the twenties, as was forecast in 1921, the Transvaal showed a 30 per cent increase.

In the chart on page 50 we present the picture of Kitchin's successive estimates made in 1921, 1924, 1926, and 1929, together with the actual output for the years from 1921 to 1934. The years for which he gave exact figures are indicated by the heavy dots, while the intervening years have been interpolated on the basis of his general statements as to the probable time when the anticipated decline would show itself. It will be noticed that in each of his successive estimates the level of production for the Transvaal and for the world was stepped up. More significant, however, is the fact that whereas each of Kitchin's forecast lines for the Transvaal shows a downward trend, and his world forecasts show a downward trend in each of the last three estimates, the actual trend, both for the Transvaal and for the world, has been strongly upward.

It may be objected that the part of this increase which occurred after 1929 is irrelevant, since world prices have fallen greatly, and since the problem under investigation was the adequacy of the gold supply to maintain the price level of 1928-29. It is therefore worth while to

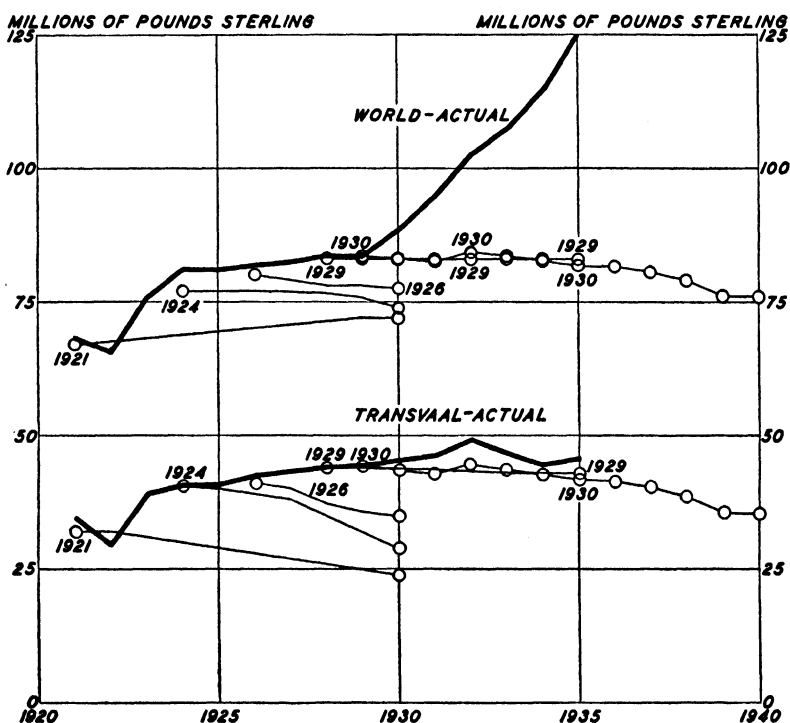
⁹ "Gold Production: A Survey and Forecast," the same, Vol. VI, No. 2, April 1924, pp. 73-76.

¹⁰ The same, Vol. VIII, No. 3, July 1926, pp. 114-19.

examine recent developments in the industry in some detail.

In the first place, the trend of South African output was sharply upward even before the depression began;

KITCHIN'S FORECASTS OF GOLD PRODUCTION, 1921-40,
COMPARED WITH ACTUAL GOLD PRODUCTION,
1921-35^a



^a Forecasts made in years 1921 to 1929 inclusive are from articles in the *Review of Economic Statistics*: 1921, Vol. III, pp. 257-63; 1924, Vol. VI, pp. 73-76; 1926, Vol. VIII, pp. 114-19; 1929, Vol. XI, pp. 64-67. The forecast made in 1930 is from the *First Interim Report*, Annex VII, pp. 55-62.

Heavy dots indicate figures taken directly from Kitchin's forecasts; light dots indicate figures interpolated in accordance with his discussion.

the rate of increase was nearly as great in 1925-29 as it was in 1929-33. Moreover, the increase in 1930 and 1931, and the flattening out of 1933-34, although they

are results of the depression, are not at all the results of changes in the level of the prices which determine the costs of mining. For those prices did not respond visibly either to the falling price tendencies of 1929-32, or to the upward push of the devaluation of the South African pound in 1932. This is shown very clearly by a scrutiny of the data concerning wage rates and cost of supplies which are published in the annual reports of the Government Mining Engineer of the Union of South Africa.

The average wages of European miners and other underground workers actually rose from 24s. 4d. in June 1929 to 24s. 9d. in June 1930, and by June 1934 had fallen only to 24s. 6d. The pay of white surface men ranged over the five-year period from a high of 19s. 7d. in 1931 to a low of 19s. 4d. in 1934. The wages of Asiatic and colored persons, other than native labor, were reported year by year as running approximately one-fourth the amount shown for white men. Native laborers received 2s. 3d. per shift in each year from 1929 to 1932 inclusive, and 2s. 2d. in 1933 and 1934. The cost of the free quarters and food provided for these laborers was estimated at 11¼d. per shift worked in 1929, 10½ in 1930, 10¼ in 1931, 10 in 1932 and 1933, and 11 in 1934.

The prices paid for almost all kinds of supplies showed remarkable stability throughout the period. The following index shows the fluctuations in prices of certain staple commodities purchased in large quantities by the mines. Commodities included in the index accounted for one-third of the total expenditure for stores in 1929, and one-sixth of the total expenditure for stores and wages combined:¹¹

¹¹ The data are weighted averages of relatives of unit values obtained by dividing the values reported (expressed in South African pounds) by the quantities. Unit values obtained in this way are subject to some

Year	Index Number
1929	100.0
1930	96.1
1931	92.5
1932	93.1
1933	94.4
1934	92.9

The extraordinary increase in the output of gold in 1930 and 1931 was apparently due almost entirely to the availability of a more adequate supply of native labor at the old wage rates.¹² The reports of the Government Mining Engineer show that the amount of native labor employed in the large mines of the Transvaal rose from 191,861 in 1929 to 199,935 in 1930 and has steadily increased since, reaching 244,110 in 1934 and 295,712 in December 1935.¹³

The President of the Transvaal Chamber of Mines, in his annual address in 1929, estimated the requirement of native labor for capacity production of the gold mines of the Transvaal at 206,000 and commented as follows:

. . . Not only is the present supply insufficient even at its maximum, but periodical fluctuations in the supply are great and have a severe dislocating effect, particularly upon the poorer

fluctuation on account of variations in quality. We have selected from the complete list all those important commodities for which the unit is sufficiently definite and the quality sufficiently homogeneous so that variations may be assumed to reflect changes in price rather than in the character of the commodity. The weights used in averaging are total expenditures for 1929.

¹² The number of white laborers showed only a nominal increase in 1930 but by 1934 had risen by about 30 per cent. This increase was presumably necessitated by the expansion of operations which was made possible by the more adequate supply of colored labor. The number of white laborers is about 9 per cent of the total.

¹³ The December 1935 figure is taken from *Business Conditions in the Union of South Africa*, January 1936 (mimeographed release issued by the South African Legation, Washington, D.C.).

mines possessing small ore reserves, which suffer severely, though it may not be apparent at the time, from any curtailment of necessary development programmes. Though the supply of native labour in the gold mines is fairly satisfactory at the moment, it was only as recently as December last that the strength was as low as 187,000.

All our investigations and authoritative advice definitely indicate that the mines will, while confined to existing available sources, experience a progressively increasing shortage of native labour, and that the strength will on the average be considerably below normal requirements.¹⁴

In 1930 the President commented on the changed labor situation as follows:

The outstanding feature of the year has been the excellent native labour supply, which has steadily risen from 190,663 in January, 1930, to 211,600 on the 20th February, 1931. The gold mines employ today about 140,000 British South African natives, about 30 per cent above the normal number at this time of the year. As you know, the excellent supply has been due principally to the difficult economic conditions prevailing in the Union, and especially in the native territories. In the ordinary way the native works for an employer about one-third of his time, his earnings during that short period providing a sufficient supplement to his income as a peasant to satisfy his needs. Owing to the exceedingly low prices now ruling for agricultural produce, he temporarily, must obtain from service with an employer a larger income than he usually finds necessary, and, as a result, not only have more natives offered themselves for work on the mines, but those who are employed are staying longer. Another influence in the same direction is the reduced scope of employment for natives with other employers; the diamond mines, coal mines, asbestos mines, as well as many farmers and industrialists, all require fewer natives. A third factor influencing the position, and the one which, of the three factors, is the only permanent one, is the steadily improving organization of the Native Recruiting Corporation, which now affords very attractive and complete facilities in all the native

¹⁴ *Annual Report of the Transvaal Chamber of Mines*, 1929, p. 56.

areas to enable natives to obtain employment on the mines in the manner most convenient to them.¹⁵

Each presidential address since 1930 has contained a reference to abundant supply of native labor as the important factor making possible the tremendous increase in gold-mining activity which has taken place during those years.

The stability of both wage rates and the prices of supplies, in the face first of the world depression and later of the devaluation of the South African pound (December 1932), is remarkable, especially since the output rose in the early years when prices and wages were failing to move downward with those of the more industrialized countries, and contracted in 1933 and 1934 when they were failing to rise in spite of the devaluation of the South African pound. In 1933 and 1934, however, the tremendous increase in the paper price of gold, due to devaluation, was not accompanied by any rise in the prices and wages paid by the mines. This fact enormously increased the profitability of what already was a highly profitable industry. Between 1929 and 1934 the tonnage of ore milled increased steadily from 31,044,500 to 40,055,750 while the amount of gold won rose only from 10,414,066 ounces in 1929 to 11,553,564 in 1932, then declined to 11,017,495 in 1933 and to 10,486,393 in 1934.¹⁶

The failure of the output to rise in these years is due to a considered policy of working lower grade ores and conserving the higher grade. The average yield of fine gold per ton, which for 14 years ending in 1931 had

¹⁵ The same, 1930, p. 38.

¹⁶ The same, 1929, p. 154; 1932, p. 94; 1933, p. 124; and 1934, p. 140. In December 1935 the tonnage was still increasing, the figure for that month setting an all-time record at 3,900,496 tons (mimeographed release cited in note 13 above).

ranged between 6.53 pennyweight (1926) and 6.96 (1932), dropped in 1932 to 6.47, in 1933 to 5.83, and in 1934 to 5.13. In December 1935 the yield was 4.66.¹⁷ There is no indication that this decline is due in any degree to exhaustion of the richer ore; it is definitely an expedient to conserve the life of the mines and take advantage of the present favorable condition for exploitation of low-grade ore.¹⁸

It was estimated by the President of the Transvaal Chamber of Mines at the end of 1933 that the prospective life of the Rand within the limits of existing mines had been doubled by the lowering of grade that had then taken place. Since then, as we have seen, the grade has been lowered much further.¹⁹

Thus the experience of 1930-32 shows that while gold production in South Africa may be no more responsive to price declines than was believed at that time²⁰ (there

¹⁷ Mimeographed release cited in note 13 above.

¹⁸ For example, in regard to 1933, President P. M. Anderson of the Transvaal Chamber of Mines said: "One of the most vital consequences of the increase in the price of gold is the encouragement thereby afforded for the mining of lower grade ore, not only in existent operating mines but also in dormant mines, and in new areas hitherto regarded as too speculative to justify exploitation. What has been done in the direction of mining such lower grade ore in the Witwatersrand producing mines is not fully disclosed by the statement that the average grade of ore treated in 1933 is 0.64 dwt. lower than the average for 1932, for the grade had been lowered progressively and concurrently with the rise in the price of gold, so that the ore worked last month was rather more than one dwt. lower than in December, 1932." (*Annual Report*, 1933, p. 41.) Compare also President Martin's remarks in regard to 1934. (The same, 1934, p. 51.) In the cases of a number of mines the royalties paid to the government are figured on a sliding scale which is dependent partly on costs per ton and partly on yield per ton. The effect of this arrangement is to minimize the profit incentive to the exploitation of the richest ores in the periods when costs are lowest.

¹⁹ The same, 1933, p. 51.

²⁰ The preliminary report of the Gold Delegation says (p. 18): "All the available evidence seems to indicate that gold production is remarkably insensitive to moderate changes in the price level."

have been none of any importance to test it) at least the industry is very sensitive to the changes in the available labor supply which result from depression in other industries.

While, as has been indicated, it was proper to assume no downward *trend* of general prices in determining whether the gold supply was likely to be sufficient to prevent such a downward trend, it was not sound analysis to ignore all future downward cyclical fluctuations in business activity and in prices. The estimates were made in a period of general prosperity; allowance should therefore have been made for the probability that there would be some years of depression in which the conditions surrounding the production of gold would be more favorable than they were during the years that were used as a basis for the calculation. That this is not a petty error is shown by the experience of 1931, when Transvaal gold production rose to 225 million dollars, as compared with an estimate of 207 million dollars, published by the Gold Delegation in the preceding year, and with Kitchin's estimate of 209 million dollars, made two years previously. This immediate response of gold production to the depression of other industries, without any real decline of prices, shows clearly that estimates based on prosperity conditions are not a safe basis for forecasting the gold production of the Transvaal.

The experience of the gold-mining district of the Transvaal in 1933 and 1934 does not so directly confute the prophets of disaster as does that of earlier years, since it was controlled by the gold premium. It does show, however, that the reserves of the Transvaal are vastly larger than was believed. The amount of ore which has been taken out of the ground since 1929 is actually considerably larger than the total remaining reserves as esti-

mated in 1925 by the Government Mining Engineer. The total tonnage of ore which Kotze estimated as remaining to be extracted was 311 million tons; the amount actually extracted by the end of 1934 was 320.5 million tons, of which less than 5 million is accounted for by new mines not included in Kotze's estimate, and there is no indication that the point of exhaustion is any nearer than it appeared to be in 1925. Ten companies (which produced 29 per cent of the total output) reported at the end of 1934 payable reserves of 45 million tons, or half the amount reported for all companies in 1924.²¹ It seems safe to say, therefore, that between the end of 1924 and that of 1934 the Transvaal gold-mining industry extracted more ore from the ground than was estimated at the earlier date to be available for all future operations, and that at the end of the period the developed payable reserves were bigger than at the beginning. Certainly the record of recent years gives no indication of exhaustion of the mines. The seven mines which

²¹ Seven large mines for which data are available showed "payable ore reserves" of 22 million tons in 1924, 25 million in 1929, and 36 million in 1934. The mines included in this sample produced 29 per cent of the output of South Africa in 1929 and 46 per cent in 1934. It may be objected that the operations of 1933-34 and the reserves then reported are not relevant since the rise in prices of gold had converted hitherto worthless ores into "pay" rock. There is some truth in this, though it does not appear probable that the mines generally have written into their capital accounts ores which are only valuable on the assumption of an indefinite continuation of the premium arising from the depreciation of the South African pound. It is more likely that the opposite situation prevails; that is, that low-grade ores which have not been counted as payable reserves will prove to be valuable when no better ore is available to keep the stamps at work. At any rate, it is clear from the available data that on the average the grade of ore worked in 1933 and 1934 would have been worth working even without the premium. The ore worked in 1933 if sold at the 1929 price would have yielded an average of 4s. 9d. above 1929 costs, 5s. 1d. above 1933 costs. The still lower grade worked in 1934 would have shown an average profit, at the 1929 gold prices and at 1934 costs, of over one shilling a ton.

actually closed in the decade²² had accounted for only 6 per cent of total production in 1923, and the other companies were not only producing more gold, but were spending far more money on development of reserves²³ and improvement of equipment, which indicates that the industry has more faith in its own future than do the government engineers and the economic profession.

PRODUCTION OUTSIDE SOUTH AFRICA

It will be seen from the accompanying table that the gold of the rest of the world has increased since 1929 much more than has that of the Transvaal, which provided 51 per cent of the world output in 1925, 48 per

CHANGES IN GOLD OUTPUT OF LEADING PRODUCING COUNTRIES, 1929-34
(In thousands of fine ounces)

Country	Change from Preceding Year					Net Change 1929-34
	1930	1931	1932	1933	1934	
United States.	+ 78	+110	+ 53	+ 88	+ 379	+ 708
Canada.	+174	+592	+350	- 95	+ 16	+1037
U.S.S.R.	+200	+400	+290	+824	+1386	+3100
West Australia.	+ 39	+ 94	+ 95	+ 32	+ 14	+ 274
British India.	- 35	+ 1	- 1	+ 6	- 11	- 40
Rhodesia.	- 6	+ 14	+ 39	+ 65	+ 48	+ 132
Transvaal.	+304	+162	+680	-544	- 534	+ 68

cent in 1929, and only 38.6 per cent in 1934. The world outside South Africa increased its output by 84 per cent between 1929 and 1934, while South Africa, after making a 10 per cent gain by 1932, fell back by 1934 to the 1929 level. The relative gain of the world outside the Transvaal is due chiefly to developments in Russia, in

²² Two other small mines which opened after the date of Kotze's report closed again.

²³ Between 1925 and 1934 main shaft sinking rose from 21,597 feet to 27,164 (after falling to a low of 18,492 in 1929) while "adits, main drives and cross-cuts" rose steadily throughout the period, from 359,502 feet in 1925 to 734,746 in 1934.

Canada, and in the United States, though there has also been a general increase since 1929 in almost all gold-producing countries.

Concerning Russia, Kitchin said in 1929: "It might increase its present total of 5 million pounds (sterling) moderately." In 1932 the Russian output was over 8 million pounds sterling; in 1933 it was about 12 million,²⁴ and in 1934, nearly 18 million. The expansion of production has been the result of the investment of considerable amounts of capital by the Soviet government, and of measures taken to increase the labor supply of the gold-mining industry. The number of steam and electrical dredges in operation is reported to have risen from 29 in 1928 to 85 in 1933, and the number of amalgamation plants from 34 in 1928 to 85 in 1933. Transportation conditions surrounding the industry were improved by the building of roads and railroads and the installation of a fleet of boats on the River Lena comprising 14 steam vessels and 55 barges. The number of workers engaged in the industry is reported to have risen from less than 30,000 in 1925-26 to more than 400,000 in 1933.²⁵

The expansion of Canadian output from 1,928,308 ounces in 1929 to 3,044,387 in 1932 is much greater than could reasonably be accounted for by the decline in prices and the increase in labor supply attributable to the

²⁴ Computed at 1929 sterling value of gold. Kursell, who made the Russian estimate used by the League of Nations for its "official" compilation, thought that the gold production of that country would remain around one million ounces per annum for a considerable time to come. The actual output in 1933 was 2,489,000 ounces; in 1934, 4,200,000.

²⁵ For further details see H. N. Lawrie, "Gold and Silver," in G. A. Roush, *The Mineral Industry during 1934*, Vol. 34. For an optimistic view of the Russian prospects compare Percy E. Barbour, "The Effect of the Future Price of Gold and Its Transiency on Production," *The Annalist*, Mar. 8, 1935, p. 379.

depression. To a large extent the expansion of the industry in Canada is due to exploration of the ore reserves of relatively inaccessible portions of northern Ontario. The decline in Canadian production in 1933 and 1934 is stated to have been due, like that in South Africa, to the exploitation of lower grade ores under the stimulus of higher paper prices for the metal.²⁶

On the other hand, the expansion in the United States is believed to be entirely due to depression factors and probably does not foreshadow permanent expansion. In 1929 output had declined steadily since 1915 (except for a small rise in 1922-24). As our table shows, it has increased in each year since 1929. This upturn is the more remarkable because a large proportion of the American output has been derived in the past from base metal refining. In 1929 no less than 500,000 ounces out of the United States output of 2,208,386 ounces was a by-product of the production of other metals. By 1931 this type of production had fallen to 250,000 ounces.²⁷ This indicates that the increase in the output of the gold mines was much more rapid than appears in the figure for total output.

SUMMARY

It seems clear that both the so-called "official" estimates furnished to the Gold Delegation and the more

²⁶ "Interest in gold mining was the outstanding feature in Canada's mineral industry in 1934. After Sept. 21, 1931, when the price of gold started to rise, the search for profitable properties became intensified and the present price has resulted in the development of many new mines and the active operation of properties closed down some years ago owing to the fact that they could not operate at the price then obtainable for gold. The quantity output of gold was only slightly greater than in 1933 since some of the larger mines are working lower grade ore. The new mills are just now reaching their stride and the quantity output for 1935 will be unquestionably higher than in 1934." *Preliminary Report on the Mineral Production of Canada*, Mining and Meteorological Branch of the Canada Bureau of Statistics, 1934, pp. 5-6.

²⁷ S. D. Strauss, *Engineering and Mining Journal*, July 1932, p. 369.

conservative figures furnished by Joseph Kitchin greatly exaggerated the prospect of an early and drastic decline of the world's gold-mining industry, and particularly of the output of the Transvaal, the leading producer.

While it is impossible to make a precise estimate of what the rate of gold production would have been during the present decade in the absence of the extraordinary stimulus which has resulted from the depression, the writer's judgment is that there was no sound reason in 1929 for anticipating any decline of world production in the decade of the thirties, assuming a continuation of the 1929 price level. It is quite possible that South African output would have remained undiminished another decade, and at most it would not have declined more than that of Canada and Russia would have increased. And a return to the 1925-29 price level would certainly not bring about for many years a return of productive activity to the level of that period. The exploratory work that has been done under the combined stimulus of widespread unemployment and exchange depreciation, the increase in the capacity of mines and crushing mills, and the conservation of higher grade ore, will all bear fruit for many years in an output at any given price level substantially larger than would have been possible at that level if the gold-mining industry had not passed through its present period of extraordinary profitability.

Our interpretation of the record is that, in the first place, estimates made by mining engineers on a basis appropriate for corporate purposes are inherently more conservative than the kind of estimates that are needed as a basis for economic policy. When a corporation is furnishing its stockholders or prospective investors with information as to its future output, it cannot properly take into consideration ore bodies that have not yet been

uncovered or drilled into. A corporation's reports, at least those of a well-established, responsible concern, must deal with what the corporation has and not what it expects to find in the ground. This downward bias of estimation is accentuated when depletion allowances, based on estimates of the lives of mines, are used as a basis for taxation of income.

But economic estimates dealing with world conditions, to be accurate, must take into account the probability that as further exploration of gold-bearing areas proceeds, some ore deposits will be found to extend beyond the limits of what are already known, though others may not. The total of conservative estimates for individual mines is less than a conservative estimate for all mines collectively.

In the second place, insufficient allowance was made for the effect of probable future cyclical fluctuations in prices and in the volume of employment. An estimate for the long distant future should be based on the probable average degree of business activity: the estimates of the Delegation were based on the record of years of high prosperity.

Finally, no allowance appears to have been made in the Gold Delegation's estimates for the improvements in the technique of mining which might reasonably be expected to occur during the period of the forecast, nor for any upward trend in the available supply of labor or of capital. Its forecast of the demand for gold, however, is based on the assumption of a 2 per cent or 3 per cent annual increase in world production and trade. Such an increase, if it occurred, would be due to the accumulation of capital, to population increase, or to technological progress; and there is no *a priori* reason to assume that these would not all affect the gold-mining industry.

An increase in the world's supply of capital would obviously promote the production of gold at least as much as it would the average of commodities, since gold mining is becoming increasingly a large-scale industry requiring huge commitments of capital, both for prospecting and for development.²⁸ As to the second factor, population increase is probably more rapid in gold-mining areas than in the world as a whole, since human fertility is declining principally in urban communities. And as to the third factor, since technological progress has characterized the entire history of the gold-mining industry, it is not legitimate to exclude it from the assumptions controlling a forecast of supply, while including technological progress in other industries in the assumptions as to monetary need for gold.

Kitchin emphasized the fact that there is little prospect of any increase in supply as a result of improvements leading to more complete recovery of gold from the ore, since the rate of recovery has already been brought up to 95 per cent, and leaves an inference that there is consequently little prospect of increase in output on account of technological advance. He fails to allow for the probability of improvements which would make it feasible to exploit lower grade ores. Any reduction of cost has this effect—an improvement in hoisting machinery or a reduction of the accident rate quite as much as the discovery of a better way of refining the ore. And there is plenty of evidence that such improvement is going steadily forward. In the Transvaal mines, health conditions have shown steady improvement for some years, especially with respect to tuberculosis and silicosis. The increased

²⁸ This statement is true of the sections of the industry which account for the bulk of the output. It should be pointed out, however, that during the course of the depression there has been a great revival of small-scale placer mining and prospecting, especially in California and Australia.

profits of mining in recent years have made possible many improvements in technique of operation which do not show up in the averages of working costs because those averages now include the costs incurred in reopening closed sections and in other operations which would not have been undertaken at all under the conditions that maintained in years of industrial prosperity.

There appear also to have been many improvements in the practice with regard to accident prevention, though the death rate from accident has shown little change in the past decade. Here again the improvement made in the more prosperous mines has been obscured by the unfavorable record made in reopening abandoned workings and working marginal reserves. Apparently some relaxation of discipline has also occurred, especially in the poorer mines, as a result of the ease with which miners can get employment in other mines.

ADDENDUM

After this chapter was in type the writer's attention was called to the report of the Low-Grade Ore Commission, appointed by the South African government on August 15, 1930, published in 1932. As the material in this report reinforces the conclusions we had reached, it has not seemed necessary to rewrite the chapter to incorporate the additional evidence.

The Commission held numerous meetings between August 28, 1930 and February 8, 1932 and heard evidence from over 100 witnesses, including representatives of the mining industry, of the Labor Party, and of numerous labor organizations, representatives of industries which transact business with the mines, mine inspectors, and independent experts. The investigation was intended to bring out ways in which the life of the South African

gold-mining industry might be prolonged by making profitable the exploitation of lower grades of ore. The report did not touch on the changed circumstances that had arisen as a result of the departure of Great Britain from the gold standard while the inquiry was in progress, nor did it deal with the effects which might be anticipated if the gold standard should be abandoned by the South African Union. The devaluation of the South African pound occurred soon after the Commission completed its labors, and the profits of gold mining were thereby greatly increased; hence the Commission's discussion of possible ways of reducing the costs of operation is not particularly relevant to conditions as they now exist. The day when cost reductions will be necessary in order to maintain output has been pushed further into the future. The report does, however, throw additional light on the prospective life of the mines.

In spite of inevitable differences in the points of view of the representatives of the various interests concerned, the investigation made it perfectly clear that, quite apart from the effects of currency devaluation, the amount of gold that is likely to be won from the South African gold fields before they are abandoned is very much larger than that indicated by the official and private estimates which have been accepted in the past as authoritative, probably even larger than is implied in our discussion in this chapter.

One point of great importance brought out was the feasibility of expanding the supply of native labor by the importation of natives from north of the twenty-second parallel of latitude, where recruiting is now prohibited. Experiments with the importation of natives from this area in the late pre-war years were unsuccessful, partly because of the extraordinarily high death rate

from pneumonia among those natives, and partly because of opposition to their competition with natives of the South African Union. The Commission found, however, that it is now feasible to control the adverse health conditions, partly by better selection of natives from suitable regions, and partly by the use of vaccines developed since the war and by other health precautions. The Commission recommended the immediate grant of permission to the gold mines to employ tropical natives under suitable restrictions as to health protection, and under a suitable limitation of numbers. Because of the greatly increased supply of native labor within the Union to which we have referred above (page 52), action along this line has so far been unnecessary, but the possibility must be borne in mind in considering the long-run prospects of the industry. An adequate supply of colored labor (which, as is noted above, the mines have rarely enjoyed) does not merely hasten the extraction of ore otherwise payable: it makes possible capacity operation and thereby reduces the cost per ton of ore milled enough to make an appreciable difference in the grade of ore which it is profitable to utilize.

All the other recommended or suggested ways of reducing the cost of mining, aside from the normal advancement of technique, involve reduction of the income of some element of the community. It is clear, however, that reductions of taxation, of wages, of railway rates, of the cost of electrical power, and of the prices of some of the supplies bought by the mines can and will be made when it becomes necessary in order to avoid drastic reductions in the scale of operations, though they are not likely to be made so long as the industry cannot show an immediate need for them.

Wage reductions which cannot be brought about with-

out conflict could undoubtedly be effected as the alternative to a closing down of the mines. Taxation would be reduced; indeed the Commission believed that a direct subsidy for the unprofitable mines, partly at the expense of the government and partly at the expense of the more profitable mines, would have been a sound investment under the conditions of 1932. Railway rates on mine supplies undoubtedly would almost certainly be reduced if cost reductions were necessary in order to keep the industry going. (The freight rate paid by the mines on explosives is three times the rate on explosives moving into export trade.) The compensation paid by the mines for industrial diseases, particularly tuberculosis and silicosis, is materially greater than would be expected if the industry did not have a surplus.

In short, the present level of costs is shot through with items which really constitute a distribution of the net income of the industry to elements in the community which are able to grasp it rather than the payment of costs that really have to be met in order to maintain a high level of output. Account must be taken of the gradual elimination of these elements of cost and the consequent lengthening of the life of the mines as the industry approaches the time when further maintenance of production would involve a cost disproportionate to the return.

As the result of an investigation made for the Commission, Professor Frankel of the University of the Witwatersrand estimated that one-half the population of South Africa obtained its livelihood directly or indirectly from the gold-mining industry, and that about one-half of the government revenues of the Union were derived directly or indirectly from this industry. Mr. G. G. Locke, chief clerk of the Department of Inland Rev-

enue, estimated that aside from railway and postal revenues, one-third of the Union revenues were attributable to the existence of the gold-mining industry. Other witnesses questioned the statistical soundness of these findings, but there seems to have been complete agreement that the whole economic life of the Union is so tied up with this industry that its elimination would be a stupendous disaster resulting in the smashing up of the whole economic system of the country. Under these conditions it seems obvious that the costs which the industry has to incur in the period of its prosperity are not a good criterion of the necessary costs involved in keeping it going for many years beyond the time when it will become unprofitable on the basis of present costs.

CHAPTER IV

THE NON-MONETARY CONSUMPTION OF GOLD

The most difficult statistical question with which we have had to deal relates to the non-monetary consumption of gold. The statistics of gold production of most countries are considered very accurate, although presumably some gold is stolen by employees of gold-producing companies and is not counted. India's imports, which are usually a major item, are also reported carefully. But when we turn to the non-monetary consumption of gold in the western world, the data are very unsatisfactory and all estimates contain a wide margin of error. Many countries do not collect data on the industrial consumption of gold, and those which do collect them often fail to show separately the use of reclaimed and that of new gold, or to separate the melting up of coins from the reclaiming of other old gold.

INDUSTRIAL CONSUMPTION

Estimates have been made in two principal ways. One method is to work directly with the scanty data for industrial consumption by countries, interpolating data for missing years and missing countries on the basis of information concerning other years and other countries, with regard to both total gold consumption and the proportion of old gold used, and substituting figures that look reasonable for those that are obviously wrong. The other method is to add together, year by year, the net annual shipments to the Orient and the reported increase in monetary gold stocks and subtract the sum of these two items from the reported gold production of the corresponding year. This gives a series of estimates of non-

monetary consumption of the Occident from which a trend rate can be projected forward. For pre-war years such results are very rough, however, since the statistics of world monetary stocks for past years when gold coin was generally held by the public are fragmentary.

The principal basic material for direct studies of pre-war gold consumption and pre-war monetary gold stock is derived from two sources, namely, the studies made by Adolph Soetbeer and published in his *Essay on the Precious Metals*, and, second, the reports of the Director of the United States Mint. Soetbeer's estimates are shown in the accompanying table.

NON-MONETARY CONSUMPTION OF GOLD, 1851-85^a
(Annual averages, in thousands of fine ounces)

Period	Production	Abrasion of Coins and Loss by Accident	Net Industrial Consump- tion	Net Oriental Imports	Total
1851-60.....	64,495	161	9,002	3,215	12,378
1861-70.....	61,087	225	18,326	9,645	28,196
1871-80.....	55,685	257	27,007	3,537	30,801
1881-85.....	23,985	129	13,503	4,823	18,455

^a U.S. Consular Report No. 85, October 1887, Appendix D, p. 528. Conversion: one kilogram = 32.1508949 troy ounces.

The United States Mint from 1890 to 1913 collected information as to gold consumption by means of a questionnaire sent to most of the countries of the world, and on the basis of the returns attempted to give some figures for a world total. In the report for 1913 (page 249) the statement is made that "the information available for a world estimate is fragmentary and very unsatisfactory," a statement which is readily confirmed by examination of the data. For the years 1913-20 no Mint estimates appeared. Beginning with 1921 the Mint has reported the gross industrial gold consumption (including old

gold which was deducted in earlier compilations) by countries. Because the items given are added up in the reports, the totals are often cited as Mint estimates of world consumption. They are really only estimates of total consumption of reporting countries, as the tables are very incomplete. France is omitted in several years; Germany is omitted until 1925, and for several of the later years the data given for that country represent only the gold delivered by the Reichsbank, which is apparently much less than half the total; and Belgium is omitted throughout.

Among recent studies, those made by Kitchin, Neisser, and Edie are the best known. Neisser¹ has made estimates for the late pre-war period, Edie² for the post-war period, and Kitchin covers both. The table on page 72 compares the estimates for pre-war years made by Kitchin and Neisser.

These estimates agree fairly closely, which is to be expected since both Kitchin and Neisser used the Mint reports as a starting point. Kitchin does not explain the source or nature of his corrections. Neisser has checked the Mint reports against the results of investigations made in England in 1900 and in Germany in 1896 and 1909; he has also given careful attention to the propriety of the assumptions of the Mint in regard to the amount of old gold included in the consumption of certain countries. His reports are undoubtedly superior to the original Mint reports, and, in the absence of more detailed information as to Kitchin's methods, must be accepted as the best that are available. It is to be emphasized, however, that the basic materials are not such as to inspire confidence in the validity of these figures.

¹ *Weltwirtschaftliches Archiv*, July 1930, 32 Band, Heft 1, p. 186.

² Lionel D. Edie, *Capital, The Money Market and Gold*, Chaps. IV-VI.

For the years since 1913 Kitchin has filled the gaps in the data collected by the Mint with his own estimates, but again he does not cite any data or sources for his

INDUSTRIAL CONSUMPTION OF NEW GOLD, 1899-1913
(In thousands of dollars)

Year	Kitchin ^a	Neisser ^b
1899.....	72,990	72,369
1900.....	76,396	74,762
1901.....	79,316	69,512
1902.....	75,909	78,882
1903.....	74,449	80,078
1904.....	77,856	82,803
1905.....	82,722	89,249
1906.....	92,941	100,613
1907.....	97,320	105,929
1908.....	88,561	96,160
1909.....	100,239	106,793
1910.....	111,918	118,622
1911.....	114,351	113,439
1912.....	124,569	123,141
1913.....	132,842	124,204

^a *Evidence before the Royal Committee on Finance and Industry*, pp. 87-88 (data converted to dollars); also *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, 1930, opposite p. 62.

^b Reference cited on p. 71.

figures. Apparently his additions and interpolations are mostly conjectural.³

Warren and Pearson⁴ estimate the industrial consumption of new gold (including Oriental absorption) by taking Kitchin's figures of annual monetary stocks and deducting the yearly increment from the annual gold production. Since Kitchin made his estimates of monetary stocks by first estimating the industrial consumption and the Oriental demand for hoarding, this simply gives Kitchin's original estimates again.⁵

³ Compare Kitchin's testimony in *Evidence before the Royal Committee on Finance and Industry*, Vol. I, pp. 91-92.

⁴ *Gold and Prices*, pp. 91, 121.

⁵ Checked against Kitchin's tables. There are small discrepancies evidently due to differences in rounding off.

Edie comes at the problem in the other way; that is, he compares changes in monetary stocks with production and with Oriental absorption, and treats industrial consumption as his residual item. For recent years this is probably the more accurate method, since monetary gold has almost all been concentrated in central banks and treasuries and is recorded much more accurately than are the amounts annually used for industrial purposes. For earlier periods, however, when gold was in circulation as coin, the data for monetary gold stocks command no more confidence than do those for industrial consumption.

Edie does not attempt a year-by-year estimate, but compares the estimated monetary stocks of 1913 and 1928, and subtracts the difference between them, plus reported Oriental imports, from the reported production. For this 16-year period he finds that monetary stocks increased 1,825 million dollars, or 122 million a year, and that there was left for industrial consumption no less than 2,599 million, or 173 million a year, as compared with Kitchin's figure of 84 million. The difference arises chiefly from the fact that Edie has used for 1913 an estimate of the monetary supply which is much higher than Kitchin's cumulative stock or the Mint figure for that year.⁶

We have applied Edie's method to the Gold Delegation's estimates of the 1913 and 1928 gold stock⁷ and find a net increase of world monetary gold stocks from 1913 to 1928 of 2,171 million dollars, or 136 million a year. This leaves 256 millions for monetary use plus Oriental absorption, as compared with Edie's estimate of 270 million, and Kitchin's of 167 million.

⁶ Compare Appendix C, p. 206.

⁷ *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, 1930, p. 93.

The only other analysis of the absorption of gold in non-monetary uses which we have to consider is Love-day's discussion, which was submitted as a memorandum to the Gold Delegation. The following passage summarizes his findings:

For the period 1907-1912, the Mint figures show gross annual consumption of between \$105 and \$110 million. From the later of these two years until 1922 only fragmentary information is available. Between 1922 and 1927, the gross consumption reported averaged about \$140 million. India is in both cases excluded from these figures.

It would appear that the amount of old gold (including coin) used in industry outside the United States of America and Egypt, where the proportion is exceptionally high, averaged in the post-war years about one-fourth of the total consumption. If this factor is employed and the known figures for net consumption in the United States and Egypt are taken, a net total of about \$88 million per annum is obtained. The factor is, however somewhat too high, since it includes old coin melted down. Further the gross figure of \$140 million per annum is too low inasmuch as, first, it does not include all countries and, secondly, certain countries only show the new gold employed. In post-war years, it would seem that the returns fail to cover about 10 per cent of the pre-war recorded consumption, but even in pre-war years they were not comprehensive.

It is necessary, therefore, to add some amount exceeding 10 per cent of the total net consumption on account of failure to report. Further additions must be made to account for old coin melted down and also for the incompleteness of the returns made by certain countries which do report. These adjustments may possibly raise the total net figure to about \$100 million per annum.

It is possible to submit this result to an indirect check. In so far as can at present be ascertained the total production of gold between December 31st, 1925 and December 31st, 1929 amounted to \$1617 million, the absorption by India to \$307 million and the net additions to the monetary stock to \$947 million, of which about \$20 million were probably due to the

gradual percolation of coin unrecorded in the first of these two years into central bank reserves. According to these figures, therefore, about \$383 million or \$95 million per annum were available for consumption in the arts.⁸

While it is true, as is stated in the last paragraph quoted, that for 1925-29 the indirect method confirms the figure of 95 or 100 million per annum obtained by compiling direct reports and allowing for old gold used over, it is also true, as was pointed out above, that for 1913-28 a comparison of production data with the increase of monetary stocks as computed from the Gold Delegation's own data, yields a very much higher figure.

Our conclusion is that the method of reconstruction of monetary stocks gives more promise of a reliable estimate than does any attempt to fill the gaps and eliminate the inaccuracies in the consumption data of the Mint reports, and therefore that a much higher figure than Kitchin's and Loveday's—say 160 million dollars per annum—is the best estimate we can make of the consumption for industrial purposes and hoarding outside the Orient, for 1913-28. We consider the figure of 256 million derived by Edie's method from Gold Delegation data as the best estimate we can get for total world non-monetary consumption.

Edie's work, which as we have seen appears to be confirmed by other studies, made the prospect for an adequate gold supply even darker than it appeared from the work of Kitchin and other European students, for he made the non-monetary consumption of the war and post-war periods much higher and the monetary consumption much lower than the accepted figures. But the low figure for the monetary absorption (1.2 per cent per

⁸ *First Interim Report*, p. 90.

annum according to Edie's estimates; 1.5 per cent according to those of the Gold Delegation) could not be projected forward as an estimate of an adequate increase in future years, because it was derived from a period when the existing monetary stocks were gaining rapidly in so-called efficiency,⁹ gains which could not be expected to recur indefinitely.

We have still to consider whether the non-monetary consumption of 1913-28 or that of 1926-29 should be accepted as the better index of the probable consumption in succeeding years. On the one hand it is reasonable to expect that the wealth of Europe and consequently its capacity to consume articles of luxury will on the average be higher during the 15 years following 1928 than for the corresponding period ending at that time. On the other hand, the fact that in several years of this period—say 1917-20—the price level was far above the level chosen as a norm for the future would account for a somewhat higher than normal consumption of gold during those years. Moreover, the trend in recent years has been toward the use of lighter articles of jewelry; platinum has come into fashion; modern dental technique uses less gold than was the case some years ago. Probably more important is the fact that during the war years and the early post-war years of depreciated currency, there was much more reason to hoard gold coin, or hold gold works of art as a cash reserve.¹⁰ Hoarded coin is theoretically included in the figures for monetary gold stock, but an unrecorded flow of this kind is likely

⁹ Because of the spread of the gold exchange standard and the withdrawal of gold coin from circulation.

¹⁰ It is said that in 1933 one wealthy man in the United States had made for himself a gold model, life size, of the hand of Primo Carnera, which as a work of art he could legally hold in a safe deposit box. As is noted below, unusually high gold stocks are now being held in London for reasons of safety.

to lead to an under-estimate of the addition to monetary gold in the years when it occurs; conversely in the years of peace and relative stability the back flow is likely to lead to an over-estimate of the amount added to monetary stocks.

In view of all these conclusions we believe it would be unsafe to project forward either the high figure shown for 1913-28 or the low figure shown for 1926-29. We suggest 100 million as a reasonable round figure for probable industrial gold consumption over the next decade, with prices around the 1929 level.

ORIENTAL ACCUMULATION

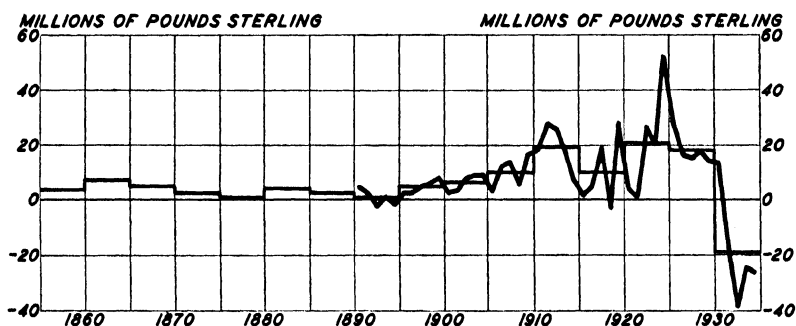
The absorption of gold by the Orient, of which Indian imports make up the principal item, is of a very different character from the increase of either the industrial or the monetary gold stocks of Europe and America. Gold in the forms of bullion, coin, and jewelry, is accumulated by the mass of the well-to-do population of India as a method of saving, and the amount so taken is subject to very wide fluctuations. It shoots up in good years, while in bad years the accumulations of those who still have a surplus are offset by the sale of gold by those who have to draw on their reserves, and the net import falls almost to zero.

The chart on page 78 shows the recorded importation of gold into India since 1859. The maximum absorption recorded for any year is 52.3 million pounds in 1924, while in 1918 there was a net release of 3.3 million pounds, the latter year being the only one in which there was no net import between 1894 and 1932. It will be noticed that in spite of the wide variation in the annual figures, the five-year averages are fairly stable. There is no discernible trend except for a sharp

rise during the years from 1894 to 1914. Before that period the average consumption was about 4 million pounds sterling and since then it has been about 16 to 18 million. The drop shown in the chart for the five years ending in 1919 is due to war-time restrictions.

It is customary in monetary literature to treat this Indian absorption as a part of the non-monetary demand and to deduct it, along with the industrial consumption,

INDIAN ABSORPTION OF GOLD, 1859-1934^a



^a Sources: For 1855-1929, *First Interim Report*, following p. 62; for recent years, *Federal Reserve Bulletin*.

from production in order to get the amount available for monetary use. This procedure is not strictly logical, for the absorption of gold by the Indian population, even that which takes the form of the accumulation of ornaments, is essentially a monetary phenomenon. Primarily this Indian jewelry serves as a store of purchasing power. In the absence of investment machinery it is an excellent device for this purpose. The turnover of the stock is very low, but probably no lower than the turnover of a considerable proportion of the bank deposits held as a reserve of purchasing power in the western world. The real factor which differentiates the Indian from the Occidental use of gold is the fact that no pyra-

mid of credit money is built up on the Oriental stock so that the mines must produce a dollar's worth of gold for every dollar that is to be saved in this way.

However, as a practical matter, since the Oriental absorption does not follow the trend of the monetary demand of the rest of the world, and since the amount of gold required to support this system of saving and emergency spending is vastly greater than that required to perform a similar service under the western system, the orthodox procedure of lumping Indian absorption with the non-monetary consumption is useful, and will be followed here.

The Gold Delegation assumed that India's demand would average about 90 million dollars, which was the rate of absorption from 1925 through 1929. To this figure only a trifling addition need be made for China unless that country should go on the gold standard.¹¹ We believe that this is a fair estimate of what the demand would be in the absence of the new factors which have come into the situation since 1929. But after England went off the gold standard, accompanied by India, the rupee value of gold of course rose sharply and there followed an astonishing release of the hoarded stocks of India. To a smaller extent the same thing happened in China. The net exports of these countries are indicated by the estimates given in the table on page 80.

The amounts shown do not, of course, represent a net release of hoards, since India is a producer of gold. They do, however, constitute a net addition to the available stock of the western world, since the Orient normally absorbs around 20 per cent of the product of the rest of the world, in addition to its own output. This release

¹¹ China's total absorption from 1925 to 1928 was estimated at 12 million dollars.

of Oriental gold is entirely a result of the devaluation of the pound and does not justify a change in estimates of the normal absorption by India on the assumption of the general restoration of the gold standard at old parities. It is quite possible indeed that the stock which has been released in this way would in time be re-absorbed by India in addition to its normal takings, if the gold

NET GOLD EXPORTS FROM INDIA AND CHINA, 1931-34^a
(In millions of dollars of 1929 gold content)

Year	India	China	Hong Kong	Total
1931.....	92.1	10.4	12.2	114.7
1932.....	195.7	22.8	11.4	229.9
1933.....	126.0	14.3	19.3	159.6
1934.....	135.7	10.4	13.1	159.2
Total.....	549.5	57.9	56.0	663.4

^a *Annual Report of the Bank of International Settlements, 1934-35*, p 15.
Data converted from Swiss francs to U. S. dollars at the rate of \$0.193.
Data include a small allowance for smuggling.

standard and the old gold parities were restored. This is conjectural, but allowance should be made for it in considering the form in which the gold standard can most safely be restored.

HOARDING IN EUROPE

For several years a large part of the incoming supply of new gold has been going into private non-industrial holdings, while at the same time much old gold has been coming back out of industrial use into the monetary stock. There have been very abrupt changes in the volume and direction of the flow between private hands; in especially unsettled periods the flow into hoards has actually been greater than the new production. As the table on page 81 shows, this was true in the second quarter of 1932, in the first and fourth quarters of 1933,

in the second quarter of 1934, and in the second quarter of 1935. During recent months there has occurred a very large increase in gold hoarding. Since March 1935

THE SUPPLY AND MOVEMENT OF GOLD, 1932-35^a
(In millions of dollars)

Year and Quarter	Gold Production	Gold from India, China, and Hong Kong	Total New Gold Available	Net Increase in the Gold Reserves of 50 Countries	Amount by Which the Increase in Gold Reserves Exceeds (+) or Falls Short of (-) Total New Gold Available
1932:					
1st.....	199	108	307	+356	+ 49
2d.....	206	75	281	-255	- 26
3d.....	216	98	314	+585	+271
4th.....	216	114	330	+337	+ 7
1933:					
1st.....	212	83	295	+ 71	-224
2d.....	211	72	283	-127	-156
3d.....	218	63	281	+337	+ 56
4th.....	224	48	272	-207	- 65
1934:					
1st.....	228	107	335	+532	+197
2d.....	236	73	309	+442	+133
3d.....	240	40	280	+364	+ 84
4th.....	245	67	312	+241	- 71
1935:					
1st.....	293	52	345	+328	- 17
2d.....	305	14	319	-438	-757
3d.....	334	59	393	+248	-145
4th.....	336	36	372	+546	+174

^a Data for 1932-34 from annual reports of the Bank for International Settlements (data converted from Swiss francs to U. S. dollars).

Data for 1935 from issues of *Federal Reserve Bulletin*. Oriental exports in 1935 for British India only, and production figures for the world outside India. Production figures have been computed by adding one-fourth to the production reported monthly which is closely in line with the difference between the total of monthly reports and the final estimates of world gold production. Figures for fourth quarter of 1935 are preliminary.

the total gold reserves of the world have actually decreased, in spite of record high production, very low industrial consumption, and the fact that India has continued to give up gold.

The amount by which the increase in gold reserves falls short of new gold available as shown in the last column does not accurately represent an addition to private hoards since there are no current data as to the movement of gold into and out of industrial use, and since no report is made of changes in the holdings of the British and American equalization funds. The largest increase in private holdings has apparently occurred in England and in France. The net imports into England in the first eight months of 1935 totaled 35 million dollars without any increase in the reported reserve of the Bank of England. The reduction in the reserves of the Bank of France was 628 million dollars, of which only 447 million is accounted for in the export figures. To a considerable extent these holdings are not private hoards in the ordinary sense, but are the working balances of industrial and financial corporations which are held in gold instead of bank deposits because of currency uncertainties. They probably include also amounts held as outright speculation against the gold standard currencies of Central Europe. Undoubtedly the removal of uncertainties concerning the future of the two francs and the guilder, coupled with a rise of short-term interest rates from their present extraordinarily low level, would bring the bulk of this gold back into the banks, though it is impossible to forecast which countries would receive it.

CHAPTER V

THE OUTLOOK FOR GOLD: SURPLUS OR DEFICIT

It is clear that the declining prices of 1925-29 and the collapse of 1929-31 are not to be explained in terms of an inadequate gold supply. Inadequacy, if it existed, would be evidenced by high short-term interest rates and failure of the credit structure to expand with the growth of world production and trade, or else by progressive reduction of reserve ratios of central banks; and these conditions do not characterize the period of restoration of the gold standard, from 1924 to 1928. World reserve ratios were figured at 40.9 for 1925 and 40.7 for 1928, and in most countries short-term money was abnormally cheap throughout the period.¹

The outstanding exceptions to the statement made about cheap money were the rates in the money markets of England and of Germany. The dearth of short money in Germany is readily understandable on grounds that have nothing to do with gold shortage. Working capital and cash reserves were depleted by the war and the inflation, and high interest rates were the price paid to replenish them. The case of England, if it were not an isolated case, might seem to support the theory of a gold shortage. For money rates were, by pre-war standards, fairly high; and there was almost constant tendency for the exchange to fall below the export point—in spite of the fact that there was nowhere any apprehension as to the inability of Great Britain to maintain the gold standard.

¹ For discussion of the money market developments of 1929, compare pp. 157-63.

But the adequacy or inadequacy of the gold supply is a world question and cannot be soundly argued on the basis of the conditions which made it difficult for one country to appropriate as large a share of the world's gold output as its past history would lead one to anticipate. The fact that the difficulty was peculiar to England is sufficient answer to the contention that the world gold supply was inadequate. Had more gold flowed to London during these years, correspondingly more would have flowed out, if the policies pursued with regard to credit, international trade, international lending, debt payment, and domestic wages had been the same and if the rest of the world had continued to outstrip Great Britain in the advance of technology and business efficiency.

Our next task is to bring together the results of the two preceding sections, one of which dealt with prospective need for money, and the other with prospective supply. As before, we start with consideration of the estimates prepared for the Gold Delegation by Love-day. The table on page 85 shows the Delegation's estimates of the amounts to be available and the amounts needed for the decade of the thirties. We omit the columns in which were presented estimates based on a bare 33 per cent reserve requirement, as it is obviously impossible for central banks to work on a basis which leaves no play for transfers and no provision for expansion.

Our conclusion, as has been stated, is that the estimate for gold production is entirely too low, quite apart from the stimulus which gold production has received from depression conditions and from the devaluation of the currencies. There was no basis for the fear of a significant shrinkage in the world's output of gold during the decade covered by the estimates; in fact, even with-

out the advent of the world depression there would probably have been some expansion. Nevertheless, the fears that were widely entertained in British and Continental economic circles from 1922 to 1929 about a prospective deficiency in the world gold supply, though greatly

ESTIMATE OF FUTURE MONETARY DEMAND FOR GOLD^a
(In millions of dollars of 1929 gold content)

Year	Estimated Gold Production	Non-Monetary Demand ^b	Available for Monetary Purposes	Increments to Gold Reserves Required		Excess or Deficit of Amount of New Monetary Gold Available	
				At 2%	At 3%	At 2%	At 3%
1930....	404	180	224	200	303	+24	- 79
1931....	402	182	220	204	313	+16	- 93
1932....	410	184	226	209	323	+17	- 97
1933....	407	186	221	213	332	+ 8	-111
1934....	403	188	215	217	341	- 2	-126
1935....	398	190	208	221	352	-13	-144
1936....	397	192	205	226	363	-21	-158
1937....	392	194	198	230	373	-32	-175
1938....	384	196	188	235	385	-47	-197
1939....	370	198	172	240	396	-68	-224
1940....	370	200	170	244	408	-74	-238

^a *First Interim Report of the Gold Delegation of the Financial Committee, League of Nations, 1930, p. 16.*

^b On the assumption that the non-monetary demand for gold increases at the rate of one per cent per annum.

exaggerated, were not entirely groundless. Even if instead of a shrinkage, the rate of production of 1929 had been maintained indefinitely the result would have been merely to push the beginning of the deficit period forward to 1939, on the assumptions of a 40 per cent cover and a 2 per cent growth in monetary needs. If stability of the trend of the so-called wholesale price level is accepted as an important objective of monetary policy, and in the absence of any reason for anticipating any change in the world's customary practices with respect to the balances held to finance a given volume of trans-

actions, it is reasonable to conclude that some reduction of reserve ratios or some increase of parity prices of gold would have become necessary during the decade of the forties.

But the real menace to the future of the gold standard, as things stood before the depression, was not in the prospective shrinkage of gold production: it was in the steady mounting of the reserve requirements on the two assumptions of a fixed percentage of reserves and a need for sufficient money to maintain the wholesale price level in the face of the increasing productivity of industry. There is a real dilemma in the operation of an unmanaged gold standard. With the progress of civilization, the output of manufactures and agriculture and the volume of services to be paid for grow continuously. The output of gold, on the other hand, cannot increase indefinitely, even if the progress of technology is just as rapid in gold mining as it is anywhere else, because the world's gold resources are being steadily depleted.

This does not mean that an emergency existed which justified any immediate positive action in the closing years of the decade of the twenties. The same methods of calculation which indicate a deficit in the volume of gold production in the early forties also indicate a surplus in the late twenties and the early thirties, and it was just as important to prevent this excess of gold in the earlier years from generating an upward movement of commodity prices as it was to prevent the deficit forecast for later years from exerting a downward movement on prices. If such a rise took place, and equally so if it was prevented by a rise in customary and required reserve ratios, the amount of gold needed in later years would be so much the greater.

In the years since 1930, however, the picture has com-

pletely changed. In the first place gold production in the years from 1931 to 1934 inclusive amounted to 2,056 million 1929 dollars instead of the 1,622 million dollars forecast by the Gold Delegation. In the second place, for the last three years the mining companies in South Africa, the most important gold-producing area of the world, probably also in Canada, have pursued a deliberate policy of conserving high-grade ore, so that the prospective life of the mines has been materially lengthened.

Third, there has been a development of gold-mine properties, particularly in South Africa, and an extension of gold mining in areas that were then considered relatively unpromising, notably Canada and Russia, which indicates that even at the level of costs of 1929 the output for the next decade can be confidently expected to be much larger than the amount which the experience of the post-war decade indicated as necessary. The capital which has been invested under the stimulus of low working costs and high paper prices of gold cannot be withdrawn if prospective returns to other industries and the wages of mine laborers and the prices of mining supplies go back to the 1929 level.

Fourth, in the United States alone there has been withdrawn from circulation, either as actual coin or as backing for gold certificates, nearly a billion dollars worth of gold. This gold has been added to monetary reserves.

Fifth, as a result of the first and fourth factors named, combined with some withdrawal of gold from circulation in other countries, the amount of gold in central reserves of the world has increased by over 24 per cent.²

² For countries reported in the *Federal Reserve Bulletin*, the central reserve stock at the end of 1929 was 10,290 million dollars; in August

Sixth, the price level has fallen. The Bureau of Labor Statistics index, which stood at 93.3 at the close of 1929, stood at 76.9 in 1934.⁸

When, in addition to these considerations, we take account of the practical certainty that any restoration of the gold standard will involve lower gold parities than those of 1929, in spite of the fact that commodity prices are lower, it is clear that the problem of monetary management in the years immediately following the restoration of the gold standard will be one of absorbing a surplus rather than compensating for a deficiency, assuming that under the restored gold standard monetary institutions, other than parities, will be similar to those of the decade after the war.

For the moment this great increase in the world gold supply has no economic significance. Gold redemption of currency and the free movement of gold in international trade have ceased, and national currency policies are no longer subject to the restrictions of the gold standard. Moreover, the vast pools of money with which the world is filled are relatively stagnant: the price level of goods, the pace of business activity, and the values of securities all reflect the prevalence of an enhanced valuation of money, or, what comes to the same thing, a lessened willingness to make economic commitments. In comparison with the periods which we prefer to regard as normal there is an exaggerated appreciation of liquidity—an atrophy of the spirit of enterprise, and consequently a tendency to hoard not only cash but bank deposits, and to let credit lines lie unused.

This fact not only deprives the gold situation of its

1935, 12,815 million dollars of 1929 content. Siam is included only in the earlier figure; Danzig and Bolivia only in the later one.

⁸ 1926=100.

immediate significance, but it also obscures the fundamental change which has taken place in the world gold position since 1930, and creates a peril that when stabilization comes it will be planned and organized on the basis of the supposed need for gold economy which dominated the economic thinking of 1920-29. If the gold standard is restored in the near future, the problem will not be that of eking out an inadequate gold supply, but of postponing the full utilization of the existing supply to the time when it may be absorbed without the creation of an unnecessarily expanded credit structure and an unnecessarily enhanced price level. The Gold Delegation visualized for 1935 a need for central gold reserves (on the 2 per cent basis) of 11,289 million dollars: the actual reserves are 12,800 million dollars, and the credit pyramid is smaller than it was in 1929. Moreover there is known to be held in private hands in western Europe something like one and a quarter billion dollars⁴ worth of gold which is likely to be added to central reserves.

The risk is not merely that an over-rapid expansion of the credit structure will follow on the stabilization of currency and the restoration of general confidence: equally serious is the risk that the world will commit itself to a gold standard with reserve requirements, and consequently with growth requirements, based on the swollen holdings that the depression has given us, making certain that the shortage which the Gold Delegation imagined will become a reality.

⁴ In all three cases, dollars of 1929 content.

CHAPTER VI

THE INTERNATIONAL DISTRIBUTION OF THE MONETARY GOLD SUPPLY

So far, our discussion has run entirely in terms of world supply and world requirements, without regard to the international distribution of the existing supply. The distribution of the gold supply cannot be ignored, however, for even under the pre-war gold standard, and still more under the monetary systems which were established in the years from 1924 to 1929, the monetary gold stock of the world was not a single liquid fund which might be expected to distribute itself in accordance with the operations of supply and uncontrolled demand. Its effectiveness has been conditioned more and more by considerations of national policy. The adequacy of the gold supply is becoming a local question, and the position of each country on this question is determined by the deliberate policy, or by the unforeseen consequences of the policies, of the monetary authorities of that and other countries. Consequently the question whether a given gold stock is adequate or inadequate to justify a general restoration of the gold standard depends in part on the existing distribution and still more on the policies that are adopted with regard to redistribution.

GOLD HOLDINGS OF CENTRAL BANKS AND GOVERNMENTS

The table on pages 92 and 93 shows the distribution of the reported gold reserves of central banks and governments at five-year intervals from the end of 1913 to the end of 1923, and at each year-end since the latter date,

both in absolute amounts and as percentages of the world totals.

It is of interest to compare the distribution of monetary gold among the more important countries, as compared with the volume of notes and central bank deposit liabilities which was pyramided on these reserves. The situation on the eve of the depression may be seen from the table on page 94, which is a condensation of a larger tabulation prepared by Loveday. It shows for 15 countries the surplus or deficiency of gold reserves at the end of 1928 as compared with a 33 per cent and a 40 per cent coverage against the notes and sight liabilities of the central banks. These 15 countries held 92 per cent of the world's monetary gold reserves; seven of them held 80 per cent of it. And of the surplus above $33\frac{1}{3}$ per cent, the United States and Argentina held an amount almost exactly equal to the world's excess; for other countries the surpluses of some were offset by the deficits of others. Nine countries had a combined surplus that was a third larger than the surplus of the world, leaving for the rest a deficit of 100 million pounds sterling below 33 per cent. And the events of 1929 accentuated the disparity. In that year the estimated increase in the monetary gold reserves of the world was 388 million dollars; the increase of the United States and France was 538 million.

Important changes in gold distribution occurred between 1928 and 1936, but as the tables on pages 92-94 show, the inequality of the distribution was not lessened. The table on page 95 summarizes the year-to-year changes in the monetary reserves of ten of the more important countries for the years from 1929 to 1935 inclusive.

GOLD RESERVES OF CENTRAL BANKS AND GOVERNMENTS, BY YEARS, 1913-35^a

1. Amount

(In millions of dollars of 1929 gold content)

Country	1913	1918	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
United States...	1,290	2,658	3,834	4,090	3,985	4,083	3,977	3,746	3,900	4,225	4,051	4,045	4,012	4,865	5,980
England.....	165	521	746	748	695	729	737	748	710	718	588	583	928	935	973
France.....	679	664	709	710	711	711	954	1,253	1,633	2,100	2,699	3,254	3,022	3,216	2,596
Germany.....	279	539	111	181	288	436	444	650	544	528	234	192	92	19	19
Argentina.....	256	304	466	444	451	451	529	607	434	412	253	249	239	238	262
Australia.....	22	104	131	130	162	110	106	109	90	75	52	42	3 ^b	4 ^b	4 ^b
Belgium.....	48	51	52	53	53	86	100	126	163	191	354	361	380	348	361
Brazil.....	90	26	49	54	54	56	101	149	150	11	...	...	6 ^c	12 ^c	18 ^c
Canada.....	117	130	127	151	157	158	152	114	78	110	78	84	77	79	112
India.....	124	64	109	109	109	109	119	124	128	128	162	162	162	162	162
Italy.....	267	203	218	221	224	242	242	266	273	279	296	307	373	306	207
Japan.....	65	226	602	586	576	562	542	541	542	412	234	212	212	233	251
Netherlands...	61	277	234	203	178	166	161	175	180	171	357	415	371	338	259
Russia—USSR.	785	...	45	73	94	85	97	92	147	249	328	368	416	439	495
Spain.....	92	430	488	489	489	493	502	494	495	471	434	436	436	437	434
Switzerland....	33	80	104	98	90	91	100	103	115	138	453	477	386	369	268
All other.....	483	531	611	616	660	660	705	731	724	699	718	710	827	858	870
Total.....	4,857	6,808	8,636	8,956	8,974	9,210	9,568	10,028	10,306	10,917	11,291	11,897	11,942	12,858	13,271

2. As Percentage of Total

United States...	26.6	39.0	44.4	45.7	44.4	44.3	41.6	37.4	37.8	38.7	35.9	34.0	33.6	37.8	45.1
England.....	3.4	7.7	8.6	8.3	7.8	7.9	7.7	7.5	6.9	6.6	5.2	4.9	7.8	7.3	7.3
France.....	14.0	9.8	8.2	7.9	7.9	7.7	10.0	12.5	15.8	19.2	23.9	27.3	25.3	25.0	19.6
Germany.....	5.7	7.9	1.3	2.0	3.2	4.7	4.7	6.5	5.3	4.8	2.1	1.6	0.8	0.1	0.1
Argentina.....	5.3	4.5	5.4	4.9	5.0	4.9	5.5	6.0	4.2	3.8	2.2	2.1	2.0	1.9	2.0
Australia.....	0.5	1.5	1.5	1.5	1.8	1.2	1.1	1.1	0.9	0.7	0.5	0.4	a	a	a
Belgium.....	1.0	0.7	0.6	0.6	0.6	0.9	1.0	1.3	1.6	1.7	3.1	3.0	3.2	2.7	2.7
Brazil.....	1.9	0.4	0.6	0.6	0.6	0.6	1.1	1.5	1.5	0.1	...	...	0.1 ^c	0.1 ^c	0.1
Canada.....	2.4	1.9	1.5	1.7	1.7	1.7	1.6	1.1	0.8	1.0	0.7	0.7	0.6	0.6	0.8
India.....	2.5	0.9	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.4	1.4	1.4	1.3	1.2
Italy.....	5.5	3.0	2.5	2.5	2.5	2.4	2.5	2.7	2.7	2.6	2.6	2.6	3.1	2.4	1.6
Japan.....	1.3	3.3	7.0	6.5	6.4	6.1	5.7	5.4	5.3	3.8	2.1	1.8	1.8	1.8	1.9
Netherlands...	1.2	4.1	2.7	2.3	2.0	1.8	1.7	1.7	1.7	1.6	3.2	3.5	3.1	2.6	2.0
Russia—USSR.	16.2	...	0.5	0.8	1.0	0.9	1.0	0.9	1.4	2.3	2.9	3.1	3.5	3.4	3.7
Spain.....	1.9	6.3	5.6	5.5	5.5	5.4	5.2	4.9	4.8	4.3	3.8	3.6	3.6	3.4	3.3
Switzerland....	0.7	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.1	1.3	4.0	4.0	3.2	2.9	2.0
All other.....	9.9	7.8	7.1	6.9	7.4	7.3	7.4	7.3	7.0	6.3	6.4	6.0	6.9	6.7	6.6
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

^a Data compiled from *Federal Reserve Bulletin*; up to the end of 1932 from Vol. 19, pp. 368-72; for 1933 from Vol. 20, p. 472; and for 1934 from Vol. 21, p. 821. For 1913-31, 47 countries are included in table; for 1932-35, 50 countries.

^b Australia and Siam.

^c Bolivia, Brazil, Ecuador, and Guatemala.

^d Less than 0.05 of 1 per cent.

RESERVES, OBLIGATIONS, AND COVER IN CERTAIN COUNTRIES, 1928^a
(In dollars of 1929 gold content)

Country	Gold Reserve	Notes and Liabilities of Central Banks and Governments	Percentage Ratio of Gold Reserves to Notes and Sight Liabilities of Central Banks	Gold Required for One-third Cover	Surplus (+) or Deficiency (-)	Gold Required for 40 Per Cent Cover	Surplus (+) or Deficiency (-)
Germany.....	666	1,539	43.3	513	153	616	50
Italy.....	266	1,053	25.3	351	85	421	155
Spain.....	494	1,120	44.1	373	121	448	46
France.....	1,247	3,200	39.0	1,067	180	1,280	33
United Kingdom.....	1,746	2,544	29.3	848	102	1,018	272
United States.....	3,746	6,564	57.1	2,188	1,558	2,626	1,120
Argentina.....	473	593	79.8	198	275	237	236
Japan.....	541	1,022	52.9	341	200	409	132
Australia.....	109	222	49.1	74	35	89	20
Belgium.....	126	371	34.0	124	2	148	22
Netherlands.....	175	371	47.2	124	51	148	27
Switzerland.....	103	222	46.4	74	29	89	14
Canada.....	191	193	99.0	64	127	77	114
Brazil.....	149	407	36.6	136	13	163	14
India.....	124	690	18.0	230	106	276	152
Total.....	9,156	20,111	45.5	6,704	2,452	8,044	1,112
World total.....	9,992	24,571	40.7	8,190	1,802	9,828	164

^a *First Interim Report of the Gold Delegation of the Financial Committee, League of Nations, 1930, p. 112.*

YEAR-BY-YEAR CHANGES IN MONETARY RESERVES OF CERTAIN
COUNTRIES, 1929-35^a

(In millions of dollars of 1929 gold content)

Country	1929	1930	1931	1932	1933	1934	1935	Net Change 1929-35
United States.	+154	+325	-174	- 7	- 32	+853	+115	+2,080
England.....	- 38	+ 9	-131	- 5	+345	+ 7	+ 38	+ 263
France.....	+380	+467	+599	+554	-232	+194	-620	+ 963
Germany.....	-106	- 16	-293	- 42	-100	- 73	+ 1	- 525
Argentina.....	-173	- 22	-160	- 4	- 10	- 1	+ 24	- 172
Belgium.....	+ 37	+ 27	+163	+ 6	+ 19	- 32	+ 13	+ 198
Italy.....	+ 7	+ 6	+ 17	+ 11	+ 66	- 67	- 99	+ 66
Japan.....	+ 1	-131	-178	- 22	—	+ 21	+ 18	+ 291
Netherlands..	+ 5	- 8	+185	+ 58	- 44	- 33	- 79	+ 79
Switzerland...	+ 12	+ 23	+315	+ 24	- 91	- 17	-101	+ 153

^a Compiled from issues of *Federal Reserve Bulletin*.

CAUSES AND EFFECTS OF THE INTERNATIONAL
DISTRIBUTION OF GOLD

The inequality in the distribution of gold did not make as much difference in the world credit situation in the post-war gold standard era, 1924-31, as might have been expected. A certain minimum stock is necessary in order to establish confidence in a currency, especially in one that has been established or stabilized recently. And there must be some surplus above legal requirements in order to permit transfers of credit to take place without exciting alarm. But above these limits the unequal distribution of the existing stock of the world does not carry with it important advantages to those countries which have the larger stocks, or seriously handicap the economic life of those which have the small stocks. Sudden redistributions of the gold stocks are a demoralizing factor in the economic life of the world, but once they have occurred and the money situation has undergone such changes as they necessitate, there is often less inconvenience in letting the new distribution stand than in trying to correct it.

The size of the gold stock which a country needs depends on the size and also on the character of the probable gold movements out of the country. International gold transfers, aside from the movement of new gold out of the country of origin, fall into two principal classes, and these call for very different handling. One type arises from changes in the flow of trade and long-term investment which have to be balanced initially by movements either of short-term credit or of gold. In the absence of a central banking system a gold outflow, by tightening the bank credit situation, tends first to draw in short-term balances when the balance of trade and long-term payments is adverse; later, if the movement continues it may force enough contraction of bank credit to contract domestic incomes and induce a rectification of the balance through a readjustment of the flow of trade and services.

Orthodox central bank policy consists, on the one hand, in neutralizing these movements by discount rate changes and open market operation when they are judged to be temporary (the standard illustration is a seasonal adverse or favorable balance) and, on the other, in accentuating them by the same means when it is judged that the condition is serious enough to require correction of this balance of payments through the encouragement or discouragement of imports and foreign lending. In the absence of panic conditions, the gold movements which result from the operation of this system have always been small, and the channel through which credit policy effects the balance of payments is the movement of short-term credit rather than any influence on the balance of goods and services. And, as has been said, the location and ownership of the great inert mass of gold that will not move in response to

any ordinary shift in the balance of payments makes very little difference. How much movement will be necessary to correct a given discrepancy depends on the sensitiveness of the nation's credit mechanism to small movements of gold. Where, as in France, a very small change in the pyramid of credit is forced by a given change in gold, because the note circulation is not pyramided on a small gold reserve, the necessary movements are large. Where, as in Great Britain, a small gold stock supports a large pyramid of credit, a small change is theoretically very effective. The general effect of the institution of central banking is to put buffers between changes in the balance of payments and changes in the local supply of money, thereby delaying the corrective working of the gold standard, sometimes until the occasion is safely past, and sometimes until violent readjustment becomes necessary.¹

In most cases the credit policies pursued by central banks, from the restoration of the gold standard until the acute strain of 1931, were not substantially different from what they would have been if the respective banks had had at their disposal twice as much, or only half as much gold as they actually had. Aside from cases which occurred just after stabilization, where additional gold had to be accumulated to meet the new legal requirements, the principal exception, as was noted in

¹ In the United States before the creation of the Federal Reserve system, when gold exports and imports worked directly on the commercial bank reserves, and again in 1920 when the Reserve system was operating near its reserve limits, before the accumulation of a huge "cushion" in the form of excess gold reserves which can move without any necessary effect on the volume of credit currency, gold movements had a very great influence over the money market. Since 1922 they have had as much or as little effect on credit as the Federal Reserve authorities have elected to give them. Compare Charles O. Hardy, *Credit Policies of the Federal Reserve System*, Chap. IX.

Chapter IV, was England. Here it is apparent that the possession of a larger gold reserve would have led to a more liberal credit policy. This, however, could only have been temporary; if other conditions were not changed the result would have been to drive out the added gold supply. In the absence of panic conditions and of special political pressures, if a country's policy is to make credit just as cheap as it can without driving any gold out, it will keep whatever stock it has; if its policy is to make credit without letting its stock fall below a fixed minimum, it will drive out gold above that minimum. World conditions, including the credit policy of foreign banks and governments, the state of business confidence, and the size of the world's monetary gold stock will determine the size of the credit structure that such a country can build up on the basis of its gold reserve, and will thus determine its reserve ratio.² All this, however, is on the assumption that there is general confidence in the stability of the currencies concerned, and in the continuance of normally profitable business activity. As is shown below, many of the gold movements of the depression era have been of such a character that central bank credit policy could exercise little or no influence upon them.

The second type of gold movement is that which results from the existence of a great mass of bank deposits and other very short-term credits, largely owned by citizens of other countries than those in which they are located, which moves under the influence of changing apprehensions as to the relative soundness of the banks and safety of the currencies of different countries,

² On the other hand, if a country's credit policy is to expand credit as much as may be possible without letting the reserve ratio fall below a definite figure, world conditions will determine the absolute size of the country's gold stock.

and occasionally in response to deliberate political pressure. Movements of this kind do not correspond to shifts in trade, in the interest rate, or in the attractiveness of genuine investment opportunity in the countries concerned; consequently they are not subject to control through the ordinary mechanism of central bank policy. Tightening of the money market is indeed as likely to accentuate as it is to allay them. Changes in the domicile of these credits, if the gold standard is maintained, may require huge gold movements which have no corrective value.

The redistribution of the world gold supply which is shown in the table on page 92 affords numerous illustrations of the second type of international gold movement just referred to. For the dominant use of gold in the depression era has been as a refuge. The outstanding characteristic of the period has been the tendency for capital to seek safety rather than profit, and gold has served the purposes of the timorous in two ways: first, as an instrument for transferring claims from the currencies that were distrusted to those in which there was confidence; secondarily, but in increasing volume, as an instrument of direct investment.³ In search of safety, funds have been shuttled about from country to country as the tide of distrust attacked first the banks and then the currencies of one country after another. First of the major gold stocks to be affected was that of Germany. The dominating consideration here was distrust of the German banks.⁴ England lost gold before she went off the gold standard; the United States also suffered drains

³ See pp. 80-82.

⁴ Australia lost its gold even earlier, but here the cause was an adverse trade balance, precipitated by the collapse of the wool and wheat markets, and not panic withdrawal of funds.

in 1931, 1932, and 1933. Gold came back into England when the worst was believed to be over, and the same thing happened in the case of the United States. Last of all to be affected were the gold standard currencies of Continental Europe—the French and Swiss francs and the Dutch guilder. In 1934 and 1935 there were heavy withdrawals of gold from the central banks of these countries—some of it for transfer into pounds sterling and dollars, some of it for direct hoarding.

A panic withdrawal of credit does not stimulate a corresponding movement of physical capital; it merely operates to depress the rate on short-term government securities and very safe acceptances in the country into which the money goes, without any considerable effect on the pace of business in that country, and to force the shipment of gold to rectify the exchanges. There have been numerous movements of this type in the last five years, such as the flow of gold out of England and the United States in the fall of 1931; into England in 1933 and the United States in 1934; into France and Switzerland in 1930-32; out of Belgium, the Netherlands, Italy, and Switzerland in 1934; and out of France and other Continental gold standard countries in 1935. The use of surplus gold to meet these calls, without corresponding contraction of credit, is legitimate: it does not nullify the corrective working of the gold standard on the credit position of the country that is losing gold as does the neutralization of movements due to trade and genuine investment factors. But no gold stock can be adequate to meet these potential calls, because every commercial country has a volume of notes and commercial bank deposits payable on demand far greater than the amount of gold which it holds on reserve, or can borrow under panic conditions.

The history of gold movements during the depression thus affords ample evidence that no gold supply can ever be adequate if adequacy is tested by the ability of a country to meet gold drains based on loss of confidence in the country's credit structure. The banking structure of the modern world, with its huge pyramid of deposits nominally convertible into gold on demand, and actually represented by assets that cannot be liquidated, is full of dynamite. When holders try to shift it from one bank to another, there is a bank failure; when they try to shift it from one region or country to another, the alternatives are wholesale bank failures, moratoria, or suspension of the gold standard; and of these alternatives the abandonment of the gold standard is always preferred.

The German Reichsbank had at the end of May 1931 one of the strongest gold positions of any central bank in the world. The gold stock was 569 million dollars, the fourth largest in the world, and the ratio to notes and demand liabilities was over 50 per cent. Yet it took only a few weeks of panic withdrawal of foreign assets to force the virtual abandonment of the gold standard.

Australia and Brazil lost their entire gold reserves quite early in the depression. Argentina and England, on the other hand, kept theirs almost unimpaired, Japan lost only a third of hers, and the United States came through the experience of 1933 with a larger reserve than she had in 1930. The difference is that the first-named countries used the gold reserves for the only purpose for which such large reserves could possibly ever be useful; that is, to meet the demand for liquidation of short-term obligations of central and private banks. Having used up their stock in this way, they were forced to stop payment. The countries just mentioned

which kept gold reserves in the face of credit withdrawals did so by refusing to use them; they suspended gold redemption while they still had large reserves which had been collected for the precise purpose of meeting such demands, or at least of creating confidence that such demands would be met, and thereby inducing domestic and foreign investors to entrust their balances to the care of the country's banks.

But whether a country gives up substantially all its gold in meeting such calls, as Germany did, or suspends gold payment with its stock substantially intact, as did England and the United States,⁵ the final result is the same. Long before the potential withdrawals are all made, the gold standard must be abandoned or protected by such rigid measures of exchange control as are tantamount to its abandonment. So much credit is pyramided on the gold stock that withdrawals of the massive type that cannot be checked by rising money rates presently exhaust the cushion of excess reserves.⁶

⁵ In the case of the United States, the gold stock was so enormous that it seems likely that the flight of currency would have spent itself before the gold stock was exhausted if the Reserve Banks had paid it out freely.

⁶ Incidentally, the experience of recent years shows that less has been accomplished by withdrawing gold from circulation than was anticipated. There is a widespread impression that the position of central banks is now much stronger than before the war, by virtue of the fact that they are not exposed to the risk of an internal drain; that is, the withdrawal of gold by domestic citizens from considerations of safety. Whereas before the war central banks had to be prepared to meet both foreign and internal drains, they now have to make provision only for prospective foreign withdrawals. This argument overlooks the fact that the determination of the internal drain creates a correspondingly increased hazard of foreign drain. If a domestic citizen cannot draw out gold to hold when he fears for the safety of his bank or the stability of the exchange of his country, he buys the currency of a foreign country in which he has more confidence, or buys gold abroad. Then the claim on domestic currency which he has sold presently appears as the claim of a foreign central bank. Thus the external drain includes what under pre-war institutions would have appeared as a domestic drain. Among the foreign claims against a central bank, there is no way to distinguish those

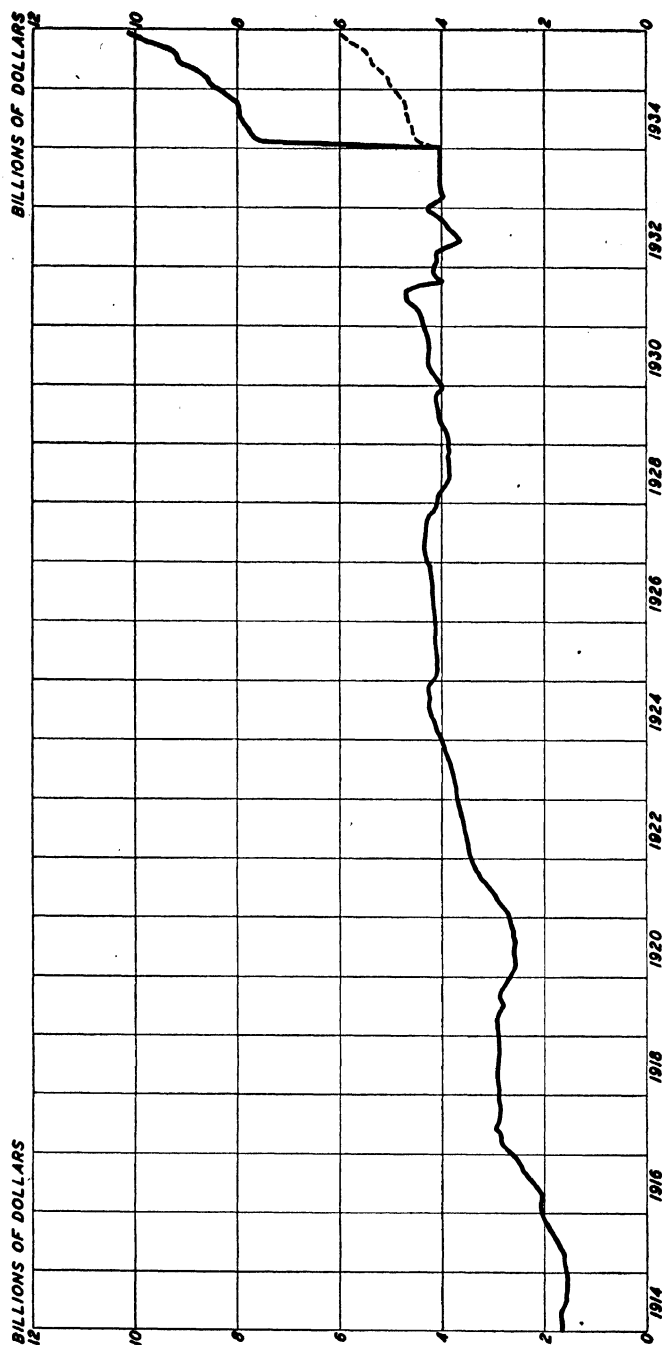
THE GOLD HOLDINGS OF THE UNITED STATES

Because of the extraordinary size of the gold reserves of the United States, it seems worth while to examine the origin of these holdings and the extent to which they are utilized for monetary purposes. As the chart on page 104 shows, the gold stock of the United States has been built up through four great waves of accumulation, the first occurring in 1915-17, the second in 1921-24, the third in 1929-31, and the fourth in 1934-35. The first two of these movements were incidents of the war and early post-war disorganization of the monetary systems of Europe. Gold was not bought freely at the mints or central banks at its market value in the depressed currencies; hence the product of the mines and any gold which may have been released from hoards flowed to the countries where its market was best. Except for sale to America or to the Orient, gold was really a frozen asset. During the war the needs of belligerents for food, clothing, and war supplies made it imperative to avoid the accumulation of such frozen assets, and the gold moved to neutral countries.

During the period of American participation in the war, government credits were made available to the allies, and the gold inflow into this country stopped. After the war, private credit was extended to Europe in large amounts for several years, but after 1920 it was available only in a greatly reduced volume. As the

that are of domestic origin from those that are truly foreign, but it is known that in a number of cases the foreign claims arising from a currency flight on the part of domestic holders have been very large. The withdrawal of gold from circulation has effected an economy of gold, but it has not relieved the insecurity of the world's banking structure. It ought to have been evident from the first, however, as it is now evident from experience, that the only substantial result of this "reform" is to change the form of the drain of gold which results from domestic distrust of a currency.

MONETARY GOLD STOCKS OF THE UNITED STATES, BY MONTHS, 1914-35*



* Historical data are in the annual reports of the Federal Reserve Board, and later data from *Federal Reserve Bulletin*. End of month figures in dollars of 1929 gold content up to and including January 1934; thereafter in dollars of present content.

European demand for commodities was scarcely less urgent in 1921-24 than it had been during the war, the gold stocks of Europe were drawn upon again. Shipping conditions now made it possible for Europe to draw on a greater range of sources for its necessities than during the war; hence the more distant overseas countries now participated in the exchange of goods for European gold. During this period the bulk of new gold of South Africa and the old hoards of Russia and Germany moved to the United States, to Japan, and to a less extent to Canada, Australia, and South America.⁷

Because of the fact that all of Europe was off the gold standard, the flow of gold to the United States and to other overseas countries did not, for the time being, curtail the monetary volume of purchasing power in the countries that were losing gold, nor did it result in an expansion of monetary purchasing power in the United States. For, as is noted below (page 154), the policy of the Federal Reserve system was not to attempt to make the new gold the basis of a pyramid of reserve credit. Traditionally, the reserve ratio was the guide to credit policy; in this situation either the required ratio had to be increased or the reserve ratio had to be abandoned as a guide. The solution of the problem was the policy of maintaining a "sound credit condition," that is, of making bank credit easier or tighter in accordance with the trend of productive activity in the United States with little or no regard to the size of the reserves or the direction of gold movements.⁸

Between the middle of 1924 and the middle of 1930 there was no net inflow of monetary gold into the United

⁷ Compare p. 152.

⁸ Compare Hardy, *Credit Policies of the Federal Reserve System*, Chap. IX.

States. A small inflow in 1925 and 1926 offset the outflow which occurred in 1924-25, and the inflow of 1929 which resulted from the stock market boom and the consequent restrictive policy of the Federal Reserve system was smaller than the outflow which occurred in 1927-28. During the period from the end of 1928 to the autumn of 1931, about 850 million dollars was added to this country's gold stock. This gold came for the most part from Australia, Japan, and South America; it went not only to the United States but to the other leading industrial countries. The movement was due chiefly to the extremely unfavorable balances of international payments of these countries, which resulted from the worldwide decline in the value of raw materials.

In the summer of 1931 the inflow into the United States was augmented by a run on the gold reserves of Germany. In the first three weeks of June the Reichsbank lost 230 million dollars of gold, about one-half of which was transferred either directly or indirectly to the Federal Reserve Banks. After the drain on German reserves subsided, withdrawals from London began on a large scale, but most of this gold went to Continental Europe. After the suspension of the gold standard in England in September there was a great wave of withdrawals of European funds from this country, largely because the losses that had been incurred or were in prospect in connection with London balances created a general reaction against the practice of holding liquid funds abroad. As a consequence, the United States lost 725 million dollars of gold between the middle of September and the end of October, most of it going to France, Belgium, Switzerland, and the Netherlands. This outflow nearly ceased in the last two months of 1931 and the first few months of 1932, but it was re-

newed on a large scale in May and June of the latter year, probably because of the expanded open market operations of the Federal Reserve Banks and the new shock to confidence given by the Kreuger failure.

The increase of the United States monetary gold stock in the last part of 1932 represented in part the release of funds which had been earmarked for European central banks during the early summer, and in part the continued movement of gold out of Canada and the Orient. The drop in the gold stock in the early part of 1933 is, of course, a reflection of the banking panic; the horizontal curve for the remainder of the year is due to the fact that gold required by the Treasury was not included in reported gold stocks until the *de facto* stabilization of the dollar on February 1, 1934.

The increase in our monetary gold stock during February and March of 1934 constitutes one of the most rapid changes in the record. To the extent of about 200 million dollars it reflects simply the inclusion in reported stocks of gold which had been bought by the Treasury and the Reconstruction Finance Corporation during the preceding months. To the extent of 2,800 million dollars it represents a revaluation of the existing stock. But in addition there was an enormous importation, amounting to over 690 million dollars for February and March and about one billion dollars for the year as a whole.

The imports of the first part of 1934, together with the purchases made by the Treasury in the preceding months, constitute the only case in which the increase of United States gold stock can be clearly seen to have been the result of a deliberate policy of acquiring gold on the part of the United States. The revaluation at the end of January 1934 was at a parity substantially below the

exchange value of the dollar against the gold standard currencies,⁹ and the revaluation was not at once followed by a corresponding decline in the value of the dollar on the exchanges. Thus there was an abnormal profit in converting gold standard currencies into gold, selling the gold to the United States Treasury for dollars, and using the dollars to re-purchase the gold standard currencies. As a consequence, gold imports of the United States jumped to 453 million dollars in February and 238 million in March. By these purchases the exchange value of the dollar was brought into line with the new parity, and incidentally exchange was made available to finance a substantial excess of commodity exports over imports into this country.

Since March 1934 there has been no such discrepancy between the exchange value of the dollar and the buying price of gold, and in 1935 there was apparently a small excess of outward over inward payments for goods and services. There has, however, been an international flight from the gold standard currencies of Europe and, partly as a result, a great volume of investment of foreign funds in United States securities.¹⁰ These investments have kept the exchanges near or at the import point and still more gold has been drawn into the country. This movement would have been even larger had it not been for the silver purchases of the Treasury, which have operated to support the foreign exchanges and equalize the balance of payments.

⁹ The dollar was revalued at 59.06 per cent of its former parity, but its value in relation to the French franc was about 63 per cent of parity.

¹⁰ In part this investment is presumably a repatriation of American funds which went abroad in 1933; in part the effect of the American business revival on the confidence of foreigners in the future of American industry; and in part a speculation against the Dutch guilder and the French and Swiss francs.

The gold movements of the past two years have been described by the Federal Reserve Board as follows:¹¹

The movement of gold to the United States has continued. From the middle of September to December 5 gold imports amounted to more than \$750,000,000, and additional shipments were in progress at the end of the period. Part of this gold has been drawn from such sources as mines and private hoards, but the bulk of it has come from government and central bank holdings in Europe.

The movement from central gold reserves of European countries appears to reflect three major influences. One of these is of recent development. The disturbed European situation which preceded and accompanied the outbreak of hostilities in Ethiopia led to a transfer of liquid balances from London to New York. The movement started in September and reached its height early in October. The nationals of many countries who had employed London as a financial center, as well as the British themselves, were active in the movement. Toward the end of October this movement subsided.

The second factor in the situation has been of somewhat longer duration. Foreign purchases of American securities began to exceed sales last May and the net inflow of foreign funds into American securities has continued practically without interruption up to the present time. The intensification of this movement in the autumn is attributable in some degree to disturbed political conditions abroad, but the movement as a whole appears to reflect a feeling among foreign investors that an opportunity for profitable investment of their funds is offered by the American market. The foreign purchases of American securities began several months before the transfer of liquid balances from London to New York incidental to the growth of political tension in Europe, and they have continued since these transfers ceased to be a significant factor.

The third factor, which has been operative now for several years, is the international position of the gold-bloc countries. A special problem has been created for these countries by the general abandonment elsewhere in the world of previously existing

¹¹ *Federal Reserve Bulletin*, December 1935, pp. 789-91.

exchange parities and the introduction of exchange controls by several countries that still officially adhere to the old parities. Capital in the gold-bloc countries has proved to be more sensitive to the condition of national budgets and to political difficulties than in the countries that have altered their currencies during the depression. A series of crises have occurred differing in intensity, but each characterized by a sharp outward movement of capital and gold.

The most general movement of this sort, although not the first, occurred last spring after Belgium had devalued its currency. During the ensuing movement Switzerland, the Netherlands, and France lost large amounts of gold. In July and again in September there were further gold withdrawals from the Netherlands as a result of political difficulties connected with the government's economy program. When the substance of this program was approved early in October the movement of gold was reversed. Since the beginning of October the Netherlands Bank has lowered its discount rate from 6 to $3\frac{1}{2}$ per cent.

The principal outflow of capital recently has been from France. During the preparations for the meeting of the French Parliament on November 28 to debate the economy decrees and the 1936 budget a heavy export of capital began. On October 29 a large majority of the Finance Commission of the French Chamber of Deputies voted a report recommending that the budget presented by the Cabinet be amended so as to diminish the burden on the lower income groups, and instructing the chairman to study certain possible offsets to the deficit created by the amendments. At the request of the Cabinet the Finance Commission agreed to reconsider their original report, but uncertainty with regard to eventual action by the Commission and by Parliament on this and other major issues has since dominated French financial markets. During November prices of government securities fell below the levels reached in the crisis last spring and the discount on forward francs widened.

The gold shipped from France to the United States as a result of the outflow of capital in recent weeks has been drawn from reserves of the Bank of France, in contrast to the movement in September and October which reflected for the most part British support of the pound sterling in Paris. At the beginning of December the movement of French gold to this

DISTRIBUTION OF MONETARY GOLD 111

country was still in progress notwithstanding increases in the discount rate of the Bank of France from 3 to 6 per cent; and the Swiss franc had also declined to the gold export point.

The current movement of gold from Europe is the fourth major movement since the dollar was revalued on January 31, 1934. A table showing by countries of shipment the amount of gold received during these four movements and during the period as a whole is given below. The largest amount of gold

NET IMPORTS OF GOLD TO THE UNITED STATES
(In millions of current dollars)

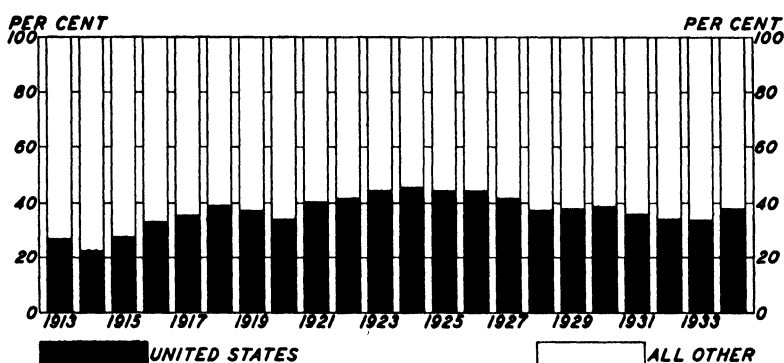
Gold Shipped from	Four Periods of Largest Gold Movement				Entire Period Feb. 1, 1934-Dec. 5, 1935*
	First Period, Feb. 9- Apr. 10 1934	Second Period, Nov. 8, 1934- Feb. 21, 1935	Third Period, Apr. 5- June 20, 1935	Fourth Period, Sept. 10- Dec. 5, 1935	
England.....	376	146	2	151	778
France.....	127	152	347	471	1,087
Netherlands..	74	42	118	58	324
India.....	15	42	3	39	154
Canada.....	20	31	17	27	172
All other.....	36	45	13	19	189
Total.....	648	457	501	766	2,704

* Includes net imports for dates not covered in selected periods shown, but excludes imports of gold acquired abroad by the United States Treasury prior to Feb. 1, 1934.

has come from France, but in part this is attributable to the fact that several other leading countries deal in gold through the Bank of France, which is the only central bank in the world today that pays out gold at par for every purpose. Hence much Swiss, Italian, English and other gold has reached this country by way of France. On the other hand most of the gold that has come to the United States from England has been drawn from the London bullion market, which receives new-mined or dishoarded gold from many foreign sources. Gold from Canada represents the product of the mines, and that from India represents sales from the accumulations of the Indian public.

The position of the United States in the international gold market can be understood better if the growth of our gold reserves is shown not only in absolute amount, but in comparison with the general growth of the monetary gold stock of the world. The accompanying diagram shows the gold reserves of the United States as a percentage of the reported gold reserves of 50 countries, by years, for the period from 1913 to 1935. The table on

GOLD RESERVES OF THE UNITED STATES AS PERCENTAGE OF REPORTED GOLD RESERVES OF 50 COUNTRIES^a



^a Computed from data given in *Federal Reserve Bulletin*.

page 93 shows the percentage holdings of the other principal gold holding countries. It will be noted that for most of the period covered, the acquisitions of gold by the United States represent no more than its proportionate share of the gold which has flowed to the monetary reserves of the world from new production and, recently, from industrial use and from the hoards of India. The exceptions are the years 1914-24 when Europe was converting its gold reserves into munitions and foodstuffs; 1934-35 when the United States was buying gold as a part of a deliberate policy of holding down the value of the dollar on the foreign exchanges; and 1935 when

the United States accumulated gold on account of capital movements in spite of the disappearance of the favorable balance of payments on account of trade and services. From 1924 to 1933, proportionate holdings of the United States greatly decreased.

Under present arrangements the gold stock of the United States is concentrated in the federal Treasury, the amount reported on January 20, 1936 being \$10,170,998,453.05. Of this amount 156 million constitutes the reserve against greenbacks and Treasury notes of 1890; 123 million is held against the gold certificates which have not been turned in for redemption; 15 million constitutes the redemption fund against Federal Reserve notes; 1,800 million constitutes the exchange stabilization fund;¹² 472 million is held in the general fund. The remainder, 7,604 million, is held against gold certificates, which are owned by the Federal Reserve Banks and constitute the bulk of the reserve of those institutions.

Under present arrangements, gold which is imported by banks, and that which is turned in by producers and by dealers in old gold, is all bought by the Treasury and paid for by checks against the government's balances with the Federal Reserve Banks. From time to time these balances are reimbursed by the issuance of gold certificates which are deposited with the Federal Reserve Banks and credited to the Treasury's account.

It will be seen that under this arrangement an import of gold increases the reserves of the commercial

¹² An unreported fraction of this has presumably been invested in foreign currency assets in controlling the foreign value of the dollar. The remainder of the profit from revaluation, amounting to a trifle over one billion dollars, has been taken into the general assets of the Treasury.

banks by a corresponding amount, since the checks which they or their depositors receive from the Treasury in payment for the gold are credited to their reserve accounts. The reserves of the Federal Reserve Banks are not immediately increased correspondingly, but are increased later when the Treasury issues and deposits new gold certificates. The net effect, therefore, of the importation of a million dollars worth of gold is first to increase the reserves of the commercial banks by one million dollars, and later to increase those of the Reserve Banks by the same amount. Since both the Reserve Banks and the commercial banks already have large excess reserves, the volume of bank lending and consequently of bank deposits is not affected. If the import results from a foreign purchase of gold by a domestic bank, all that is accomplished from the bank's standpoint is the conversion of a foreign asset into excess reserve, the bank presumably finding its compensation in the profit from the exchange transaction.

It will be seen that the bulk of the gold reserve, though nominally a Treasury asset, is not available for governmental purposes; it is the property of the Reserve Banks, which are owned by the commercial member banks. In the last analysis it belongs to the depositors in the member banks of the Reserve system. It could be brought into active monetary use only by a great expansion of reserve credit, or by another devaluation followed by expenditure of the profit by the Treasury.¹⁸ The only amounts which are directly available for governmental use are: (a) the balance in the general fund, which constitutes about one-fifth of the total amount

¹⁸ It could, of course, be brought technically into monetary use without any expansion of credit by a change in reserve requirements which would make it a part of the necessary reserves of the Reserve Banks.

held in that fund; and (b) the exchange stabilization fund. These two funds, or a total of 2,272 million dollars (less whatever fraction of the stabilization fund has already been invested), would be available in this country, in the event of a general restoration of the gold standard, for the purposes suggested in a later section of this chapter; that is, for loans to countries which now have a deficiency of monetary gold, and for the establishment of an emergency reserve outside the Reserve system to be held against mass withdrawals of foreign and domestic balances.¹⁴

THE OUTLOOK FOR REDISTRIBUTION OF GOLD

In any general restoration of the gold standard, it must be assumed that the gold parities will be, on the average, at least as low as those indicated by the present paper prices of gold. It is more likely that some of the countries which still maintain the 1929 prices of gold will devalue their currencies than it is that those which have devalued or allowed their currencies to depreciate will undertake even a partial restoration of the old parities. It is obvious, therefore, that at the outset, unless credit expands in proportion to the devaluation, the world's gold stock will bear a higher ratio to outstanding demand liabilities than was the case before the depression. If the required reserve ratios of central and commercial banks are not raised, there is in sight a very

¹⁴ In addition, since the Federal Reserve Banks hold nearly an 80 per cent reserve in gold certificates against their note and deposit liabilities, it would be feasible for them to transfer either 2 billion dollars to the Treasury in exchange for government securities, thus lowering their reserve ratios and augmenting the stock available for foreign lending in connection with a general restoration of the gold standard, or for inclusion in the suggested emergency fund. Whether the securities issued in connection with this transfer should bear interest is unimportant since the earnings of the Reserve Banks above a stipulated maximum revert to the United States.

large world surplus not only above legal requirements, but above the 40 per cent level which existed in 1925-29. It is probable that this excess will, as in the past, be concentrated in the reserves of comparatively few countries.

The experience of 1924-29 throws grave doubt on the probability that the surplus gold will redistribute itself through the operation of ordinary commercial and investment forces. The deficit countries will do without large gold stocks rather than try to acquire them by deflation. If they try to secure them by fixing abnormally low parities for their currencies, the existing instability and uncertainty will be perpetuated. The surplus countries will probably take the position which was taken by the Federal Reserve authorities in 1922-28, that the surplus stock ought not to be built into the structure of required, or virtually required, reserves, either by permitting or forcing huge credit expansion or by raising reserve requirements.¹⁵ The United States during those years did not in fact pursue any active policy of sterilizing gold—it merely refrained from carrying through any positive program to build up the credit structure in proportion to the increased gold reserve; yet the size of the surplus stock remained on balance practically unchanged.

Moreover, it is practically certain that if the stock of the countries which start out with an excess does remain substantially unchanged for a period of years the excess will in fact become a part of the psychologically neces-

¹⁵ “. . . It has been held by some that the great supply of specie now in the Federal Reserve Banks and aggregating in the neighborhood of 3 billion dollars, is not normally the property of the United States and must eventually be expected to go back in part to the countries which are seeking to reestablish themselves upon a specie basis. This is undoubtedly true. . . .” *Federal Reserve Bulletin*, 1922, Vol. 8, pp. 3-4.

sary reserves of those countries. In 1925 and 1928 monetary authorities of the United States permitted substantial withdrawals without taking any steps to check them, but in 1932 a policy of credit expansion was abandoned as a result of adverse gold movements, and again in 1933 gold exports, in spite of the enormous size of the country's gold stock, were taken as the signal for protective measures. The gold had been here long enough so that its retention seemed to be normal.

We see no reason to anticipate that a general stabilization would be accompanied or followed by a rational redistribution of the gold stock, if the matter were left to the operation of ordinary trade and credit forces. A possible solution would be that at the outset reserve ratios be adjusted to gold stocks so as to make the existing distribution the normal distribution for the future. If this were done successfully¹⁶ no considerable international gold flows would be necessary after stabilization beyond those resulting from the normal functioning of the gold standard, that is, the distribution of new gold and the rectification of seasonal and other temporary disequilibria. In extreme cases of gold shortage, like those of Italy, Germany, and Australia, an addition to the gold stock would of course have to be made at the outset, presumably by long-term borrowing. Within reason, as we have stated, one amount of gold is as good as another, provided the credit structure is adjusted to it; the important thing for the functioning of the gold standard is not the size of the stock of different countries, or of the world as a whole, but the readiness with which transfers of gold from one stock to another effect

¹⁶ This would, of course, require a reasonable adjustment of parities at the outset, as any material overvaluation or undervaluation of currencies would probably result in abnormal gold flows.

the smooth readjustment of local to world conditions. Without this an essential value of the gold standard is lost, and with it not only the size of the gold stock but almost any distribution of the great inert mass of gold which never moves is substantially irrelevant.

But the currencies of the world cannot safely be stabilized on the basis of reserve ratios corresponding to the present stocks, or a redistribution of present stocks, unless there is found some basis for future expansion other than the accretion of new gold by a percentage of the total existing stock corresponding to the growth of production and trade. For future gold accretions from new production, if they have to be proportional to present swollen stocks, would be inordinately costly and presently inadequate. The higher the ratios fixed (and very high ratios would be necessary in order to absorb the existing gold stock of a number of countries), the greater the flow of new gold necessary in the future to take care of the growth of trade and industry. What is really needed, if the percentage reserve principle is to be retained, is a segregation of the gold stock into two parts, only one of which need grow by a given percentage in order to provide for an expansion of credit by that percentage. The remainder of the gold stock would be isolated from the reserve that controls ordinary credit policy.

It may be objected that this would mean that the labor and capital which have been sunk in the expansion of the gold-mining industry over the past decade have been wasted. But this would be equally true, so far as the writer can see, under any other conceivable set-up. The mining of gold on anything like the present scale is a social waste. A curtailment of that waste is desirable, but the waste already incurred is of infinitesimal im-

portance compared to preventing either a perpetuation of the present régime of fluctuating currencies or the initiation of a system which would perpetuate the necessity for a continued expansion of the gold-mining industry. That men risk their lives and spend their lives in extracting gold from the bowels of the earth in remote regions in order to bury it once more in the bowels of the earth in great financial centers—or in Kentucky—is not particularly creditable to the intelligence of the human race, but the imbecility will be glorified if stabilization gives gold a nominal usefulness which involves the necessity of continuing that waste of human effort until it is stopped by sheer exhaustion of the gold-bearing strata of the world.

The problem is to safeguard against the development of an excessive requirement for new gold in the future and at the same time to protect the credit structures of individual countries against mass withdrawals of short-term credits without losing the substantial value of the gold standard as a check on local inflation. The existing vast surplus of gold above present legal requirements should be set aside in some way to meet mass withdrawals of short-term credit without a pyramidal effect on the structure of domestic credit, while exchange movements that were due to the operation of trade and long-term investment factors are still permitted to operate directly on the reserve structure without effect on the earmarked reserve.

To a certain extent the desired result is now accomplished, and might be accomplished on a larger scale, by a segregation of assets on the part of the central banks, the bulk of the excess of gold (and foreign exchange) above legal requirements being held in commercial portfolios and not in the reserve accounts. If the

banks distinguished skillfully between drains that indicated an economic disequilibrium and those due to a desire to shift short-term capital irrespective of ordinary economic considerations, in addition to its traditional task of distinguishing between temporary and chronic disequilibria, the business could be handled in this way.

Excess gold can also be sterilized, without any legal change, by the accumulation of huge excess reserves in central banks. The danger here is that which was pointed out on page 116; that is, that the excess reserve will come to be regarded by the bank and by the public as part of the normal reserve, and that no distinction will be made in practice between the inflows and outflows due to normal trade and investment factors, which ought to influence the credit situation in the country promptly and fully, and those of an upward character which call for offsetting central bank operations.

A more radical solution would be to convert existing exchange equalization funds, where they exist, into permanent emergency funds, and create new ones in other countries. The central banks would be allocated only enough gold to cover legal requirements plus a small cushion designed chiefly for seasonal fluctuations. The emergency funds would hold the balance, to be released freely by purchasing treasury bills or accumulating bank deposits in the event of wholesale exodus of credit balances but would not be touched in consequence of pressure on the exchanges resulting from shifts in trade or long-term investment. *Vice versa*, incoming gold which had been released from the emergency funds of other countries would be taken into the fund in exchange for earning assets or bank deposits.¹⁷

¹⁷ After this passage was written, the writer's attention was called to the presentation of the same ideas in an editorial in the *London Financial*

Under this plan the fund would be under entirely separate control from the central banks¹⁸ and its size would have no bearing on the credit policy of the central bank. Gold would be released from the emergency fund only on an appeal from the central banking authorities, backed by a showing of the existence of an emergency not amenable to treatment by the ordinary tools of central banking policy. The result would be that extraordinary withdrawals would bring about no net contraction of credit, the assets absorbed by the exchange fund being offset by the assets given up by those responsible for the withdrawal of foreign balances.

Times of Nov. 12, 1935 (p. 6): "Provided that the gold bloc currencies could be brought into equilibrium with the pound and the dollar, current experience makes it feasible to envisage the possible gold standard of the future. A nation's gold stocks would be divided between its central bank and its exchange account. If an abnormal pressure on the exchanges developed, the authorities would have to decide whether it arose from a temporary movement of capital or from an unbalanced trade position. In the former case, the offsetting gold movement would take place into or out of the exchange account's gold, and the internal credit position would be unaffected. Only if the exchange pressure arose from unbalanced trade would the central bank's gold be used, and only in that event would there be an expansion or contraction of credit and a variation of internal interest rates. In that way the state of internal trade would be affected only when it stood in need of correction and international movements of capital would cease to have a harmful effect. This would reach what should be a principal objective of future world monetary policy."

¹⁸ Preferably also independent of the treasury.

CHAPTER VII

CONCLUSIONS

Our chief conclusions may be summarized as follows:

Inadequacy of the world gold supply was not a factor contributing to the decline of prices between 1924 and 1929, and there was no immediate prospect of a serious decline in gold production before the coming of the depression.

Among the difficulties in the way of the restoration of the gold standard throughout the world, a present or prospective deficiency in the supply of gold has no place. The supply is ample to justify the restoration of the gold standard as soon as it is deemed otherwise advantageous.

On the contrary, a real problem has been created by the great increase in the world's monetary gold stock which has taken place since 1929. A general credit expansion corresponding to this increase in gold stocks is highly undesirable. It is important, however, that the sterilization of part of the existing supply not be accomplished merely by stepping up existing gold reserve requirements and thereby creating a need for proportionally increased increments of gold to take care of future growth.

Finally, the huge transfers of floating credit dissociated from shifts of the balance of trade and long-term investment, with accompanying drains of gold reserves are, as they were before the depression, serious potential sources of monetary disturbance. Until some way is found to minimize the effect of large international transfers of bank deposits and short-term investments upon

the determination of central banks' domestic credit policy, no possible gold supply will be large enough to insure against monetary disequilibrium.

We believe that if the gold standard is restored, the objectives stated can best be achieved by the establishment of some plan under which a large part of the existing world gold stock would be segregated in extraordinary reserves. These reserves, which would not necessarily be under the control of central banks, would be drawn upon to take care of extraordinary transfers of balances from one country to another, but would not be taken into consideration in determining the credit policies of central banks and other monetary authorities in their attempt to control the volume of domestic credit.

PART II
THE WARREN-PEARSON PRICE THEORY

INTRODUCTION

Professors George F. Warren and Frank A. Pearson of Cornell University have published, under the title *Gold and Prices*, a new edition of their well-known book *Prices*, originally published in 1933. The most important change is the addition of a discussion of the very recent monetary and price history of the United States in its bearing on their analysis of the price-making process. As Professor Warren was an adviser to the Administration in 1933, and is generally believed to have played a large part in shaping national monetary policy throughout the latter half of that year, the monetary theories which he holds are of special interest.

As the authors base their conclusions primarily on statistical compilations and historical narrative rather than general economic reasoning, it is only fair that their conclusions be appraised in the light of the evidence which they submit. We shall, therefore, concentrate attention for the most part on this historical and statistical material, rather than on the theoretical soundness of Professor Warren's assumptions, which are mostly unstated, concerning the price-making process.¹ Since the theory of the relationship between the quantity of money and the price level has been a subject of controversy among economists for many years, an adequate discussion of this field of economic theory would require criticism of many doctrines other than those implicitly presented in Professor Warren's writings.

The Warren-Pearson analysis includes, first, a discus-

¹ For a discussion of the relationship between the theories of Warren and Pearson and those of other economists, see Walter E. Spahr, *The Monetary Theories of Warren and Pearson*, Farrar and Rinehart Press, New York, 1934.

sion of the price experience of England and the United States for 75 years before the World War, and second, an account of the post-war price fluctuations in the same countries. The most striking thing about the authors' treatment of the historical relationship between gold and prices is the fact that their method of research and their conclusions as to the pre-war and post-war relationship of gold and prices are entirely different from each other. The pre-war analysis is statistical, and little effort is made to work out the reasons for the relationships that are found. The price movements to be explained are compared directly with the phenomena which are supposed to explain them, and there is almost no theorizing as to *why* the sequence was what it was. On the other hand, the post-war story is told as historical narrative with categorical statements as to the causal relationships. There is no attempt to support the historical generalizations by any statistical correlation whatever.

The results obtained by the two methods do not harmonize. The general monetary theories which are implied in the discussion of the post-war period are not those which are suggested by the pre-war statistics and the accompanying discussion. The pre-war statistics suggest the price movements can be explained by measurable changes in the *supply* of gold; the post-war analysis runs almost entirely in terms of unmeasurable, or at least unmeasured, changes in *demand*. As is shown below, and indeed tacitly admitted by the authors, no one would predict from the pre-war data anything remotely resembling the post-war price movements; and the explanations of price phenomena suggested by the pre-war statistical series do not fortify the hypothesis which is advanced in explanation of the post-war developments.

Of course it does not follow that the pre-war data, if correct, disprove the validity of the post-war analysis, for fluctuations in demand might become much greater in a later period than they had been in an earlier one, and so swamp the influence of the supply factors which formerly dominated. All that can be said in advance of our examination of the evidence is that the conclusion that in the post-war period prices have been controlled by the *demand* for gold can never be proved by showing that in the pre-war period they were controlled by the *supply* of gold. Hence, the analysis of the pre-war experience, with its elaborate apparatus of charts and its striking parallelism between curves of gold supply and of wholesale prices does not in any way strengthen the authors' analysis of the post-war period. This is to be emphasized, for the pre-war story is told with so much emphasis on the correlation of gold supply and price, and is accompanied by such an impressive array of supporting charts and tables, that it is very easy for a reader to assume that the authors' analysis of the post-war phenomena and their suggestions as to post-war policy rest upon the pre-war statistical investigation.

Our principal task is to determine whether either the pre-war or the post-war analysis offers a reasonable explanation of the price history of the period to which it refers. We consider first the pre-war story.

CHAPTER VIII

THE PRE-WAR GOLD-PRICE RELATIONSHIPS

Warren and Pearson's findings concerning the pre-war relationship between gold and prices are set forth chiefly in Chapters V, VI, and VII of *Gold and Prices*. These chapters, as has been stated, include a very large number of charts and tables comparing various series of monetary credit, production, and price data. The movements of the price series are compared, as a rule, with the ratio between the monetary and the production data. The central idea is that there is some definite relationship between the increase of the supply of gold on the one hand, and the growth of production on the other hand, which will result in stable prices: when the rate of growth of the gold supply is above this ratio to the rate of growth of production, prices rise; and in the converse case they fall. Variations of this central idea are tested by comparison of numerous series of data, such as English wholesale prices, American wholesale prices, world monetary gold stocks, United States monetary gold stock, the ratio of gold production to existing gold stocks, the total "circulating medium" of the United States, and the total volume of bank credit. No significant degree of correspondence is found between the year-to-year or two-to-three-year fluctuations of these various money-production ratios and the movements of prices: the case hinges entirely on the longer swings.

Before examining the details of the evidence, two general criticisms of Warren and Pearson's method of statistical analysis should be noted. The first is the au-

thors' habit of stressing those parts of the evidence which support their conclusion and slurring over those parts which seem to contradict it. In a number of cases the statistical series which depict the movement of the gold stock or of some other monetary item, usually as a ratio to production, show a striking resemblance to the price series. Sometimes this parallel movement continued over considerable periods. But for other long periods no such resemblance of fluctuation appears. The authors' analysis consists to a considerable extent in picking out periods for which the resemblance occurs and citing them as evidence of the dependence of prices on the quantity of gold or other money. Periods which offer no evidence in support of the theory are either ignored or explained by reference to factors other than the monetary supply. Only rarely is inquiry made, however, as to whether these other factors were operative during the period when the monetary and price curves showed a satisfactory correspondence, and whether allowance for them might not destroy the symmetry of the record for the periods when the theory under review seems to have been verified.¹

Our second general criticism relates to the multiplicity of inconsistent findings. The main thesis is clear enough; namely, that prices depend directly on the supply of gold. But alongside evidence which tends to sup-

¹ Thus the discrepancy between the curve of the gold-production ratio and that of United States prices just before the Civil War is explained by the panic of 1857 (p. 97) without any reference to the fact that the period for which the charts support the theory best is that which followed immediately after the panic of 1873. High prices in 1915-28 are explained by the low demand for gold (pp. 104-6) and the fall of prices beginning in 1929 by a sudden return of demand for gold, but no mention is made anywhere of the effect of the Civil War on the demand for gold. Yet elsewhere (p. 108) there are cited as examples of successful forecasting, predictions of post-war price movements which are based on the experiences of the years following the Civil War.

port this thesis there are several exhibits which tend to show that prices depend on something else.

Among the numerous interrelations between the gold supply and the price level which the Warren-Pearson charts and tables purport to show for the pre-war era are the following:

1. A close relationship between the world monetary gold stock, the world physical volume of "basic" production, and the wholesale prices of *the same date*.²

2. A close relationship between total monetary circulation, physical volume of production, and wholesale prices (all in the United States), as of the same date.³

3. A close relationship between the ratio of bank credit to production and the "general price level" (Snyder's indexes).⁴

4. A close relationship between world gold production, world monetary gold stock, and wholesale prices of *13 years later*.⁵

It is obvious that no matter how accurate the historical data, or how striking the correlations, the principles of price determination which these comparisons suggest cannot all be valid. For instance, price fluctuations cannot correspond to those of the supply of gold and also to those of monetary circulation except in periods when gold and money fluctuate together. Likewise, they cannot correspond both to world gold stocks and to United States gold stocks, except in periods when the United States' proportionate share of the world stock is substantially constant.

It is to be noted also that, for at least half the period

² *Gold and Prices*, pp. 90, 96, 98. English, French, and United States prices are used.

³ The same, p. 139.

⁴ The same, p. 144.

⁵ The same, p. 132.

covered, the data for world volume of production are wholly inadequate. There are no records of anything approximating the world volume of production of most basic commodities before 1880; the figures used are estimates based on rough and infrequent data for a very few commodities. For the years before 1865 in fact, the data used are merely estimates made by projecting backward the rate of growth observed for 1865-1914.

For 1850-65, therefore, the Warren-Pearson method is practically identical with Kitchin's method. Kitchin compared actual stocks of monetary gold with what they would have been if they had increased uniformly at an annual rate of 3.1 per cent. Warren and Pearson compare them with the rate of growth of production but assume that this rate was 3.15 per cent a year.

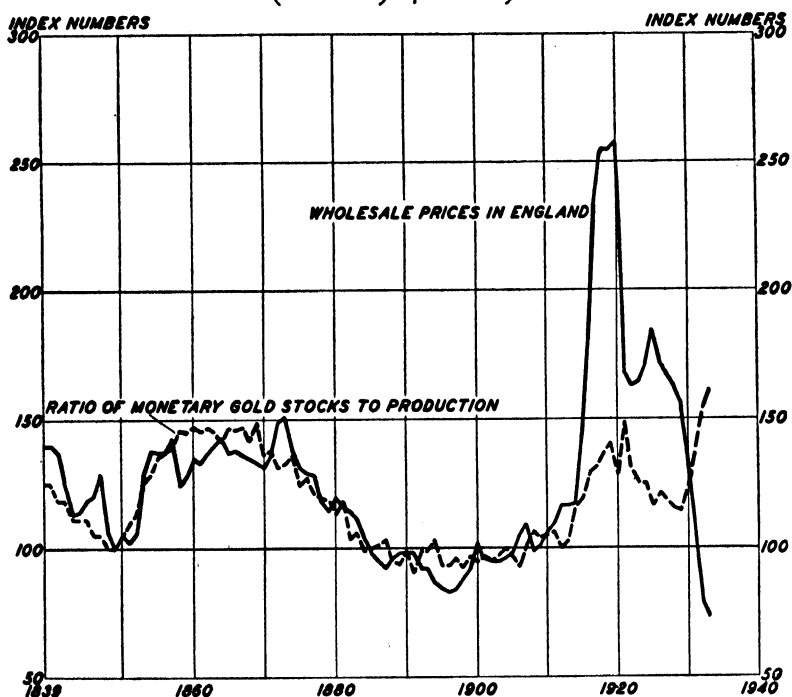
The price data used are indexes of wholesale commodity prices, though they are repeatedly referred to as measures of "the general price level."⁶ It is a well-known fact that indexes of wholesale prices, and especially those which are dominated by raw materials as are most of them, have long displayed a downward trend as compared with the cost of living, and still more as compared with wages.⁷ They are also much more subject to fluctuations on account of the influence of wars and speculative booms and depressions. As was noted on page 10, the author does not accept any wholesale price index as a test of the adequacy of the gold supply. But

⁶ For instance, on p. 21 it is stated that "the general trend of prices of over 30 basic commodities approximates the same as the general price level (Fig. 30)." Figure 30, however, compares 30 basic commodities, not with the general price level, but with an index of wholesale prices of "all commodities." For England, whose experience is especially relevant for the earlier years because England was continuously on the gold standard, the Sauerbeck index is used.

⁷ Compare Rufus S. Tucker, "Real Wages under Laissez-Faire," *Baron's National Financial Weekly*, Oct. 23, 1933, pp. 6-7.

since Warren and Pearson, along with the authors whose work was discussed in Part I, have used these indexes, and since the use of retail prices, cost of living, wages,

RATIO OF WORLD MONETARY GOLD STOCKS TO WORLD
PHYSICAL VOLUME OF PRODUCTION COMPARED WITH
WHOLESALE PRICES IN ENGLAND, 1839-1933
(1880-1914=100)



or the so-called general price level, as a test would give a still lower gold requirement, we shall confine ourselves to a criticism of these authors' findings on the basis of the price indexes which they have used.⁸

A statistical exhibit on which Warren and Pearson lay great emphasis is the comparison between the ratio of the world's monetary gold stock to world physical vol-

⁸ For a criticism of the British indexes, compare Appendix A.

ume of production, on the one hand, and the fluctuations of British wholesale prices, on the other hand.⁹ It will be seen from the reproduction¹⁰ of this chart on page 134 that for the earlier period the two curves are alike only in trend. They both show a downward trend from 1839 to 1849, an upward trend from 1849 to 1857 or 1858, and a horizontal trend from 1857-58 to about 1873. There is, however, no resemblance in the deviations from trend of the two curves within these three periods, and these deviations are very large. From 1873 to 1885 the curves run together more closely, and this period affords the chief basis for Warren and Pearson's conclusions. From 1885 to 1900 there is no visible resemblance; the price curve shows a large dip and a subsequent recovery which do not appear at all in the curve of the gold-production ratio. In 1900-10 there is a rough similarity, but thereafter no significant parallelism. For 1910-14 the superficial resemblance is due to a rise in the gold-production ratio which *followed* the price rise.

The conclusion drawn by Warren and Pearson is:

For 75 years before the World War, world monetary stocks of gold had to increase at the same rate as the world physical volume of production in order to maintain stable commodity prices in England. If gold stocks increased more rapidly than other things, prices rose; if they increased less rapidly, they fell.¹¹

So far as the statistical record goes, this statement is definitely true of about 12 years out of the 75 (1873-85), definitely untrue for about 22 (1885-1900 and

⁹ *Gold and Prices*, p. 90.

¹⁰ In this book, charts referred to as "reproduced" are redrawn from the data.

¹¹ *Gold and Prices*, p. 94.

1907-14), and only very roughly true for the other 41.¹² Moreover, as was pointed out in connection with the work of Cassel,¹³ the comparison starts at a time when prices were at the bottom of a cyclical depression.

Similar comparisons are made between the same gold-production ratio curve and wholesale prices in the United States¹⁴ and in France.¹⁵ As would be expected, these show substantially the same thing as the first chart, aside from the years 1862-79, since wholesale prices in these countries moved substantially together, barring the period when the United States was off the gold standard.¹⁶ Except for this period, differences between the price curves for the different countries are due chiefly to the selection of different commodities to make up the indexes, and do not reflect any important difference in the price movements.

In *Prices* there was published a comparison between wholesale prices in the United States and the ratio of United States monetary gold to United States physical volume of production (1880-1932).¹⁷ This chart, which is omitted from *Gold and Prices*, showed a better correspondence between the curves for the years from 1885 to 1914 than do the charts which are now published but

¹² Of the 41 years classed as showing a rough degree of parallelism, the greater part fall within the early period for which the production data are so scanty as to be practically worthless.

¹³ See p. 26. Compare also pp. 202-3.

¹⁴ *Gold and Prices*, p. 96; chart reproduced on p. 137.

¹⁵ The same, p. 98; chart reproduced on p. 138.

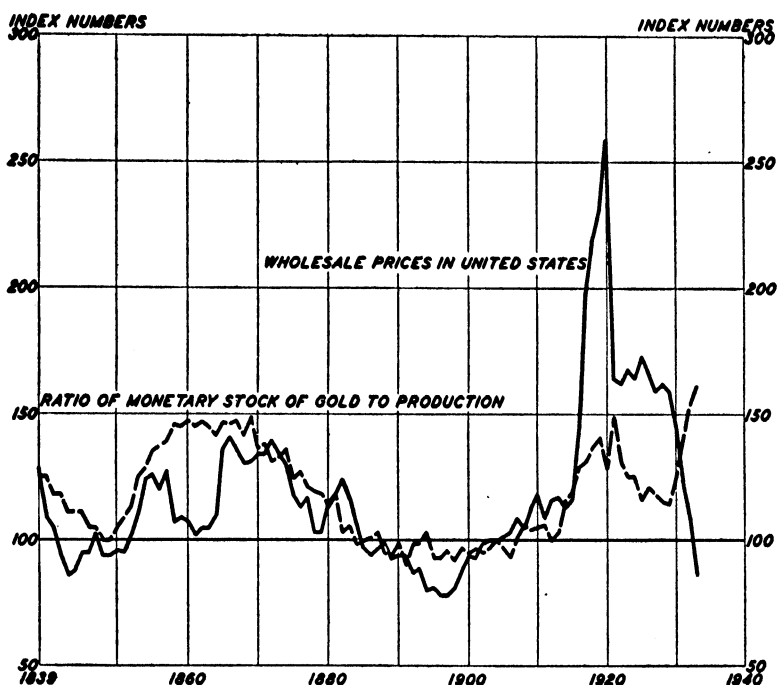
¹⁶ During this period the price data for the United States are theoretical prices, computed by comparison of actual prices with the price of gold. Such figures are affected by the erratic fluctuations in a speculative gold market, and are not trustworthy measures of the prices that would have been paid if gold had been in actual monetary use. This fact was noted by Warren and Pearson in *Prices*, pp. 74-76; these passages are omitted from *Gold and Prices*.

¹⁷ *Prices*, p. 83.

a total lack of verification of the authors' hypothesis for the years before 1885 and after 1914.

Another comparison is made in the chart reproduced on page 139,¹⁸ which shows prices and the ratio of United States monetary circulation to United States physical

RATIO OF WORLD MONETARY GOLD STOCKS TO WORLD
PHYSICAL VOLUME OF PRODUCTION COMPARED WITH
WHOLESALE PRICES IN THE UNITED STATES,
1839-1933 (1880-1914=100)



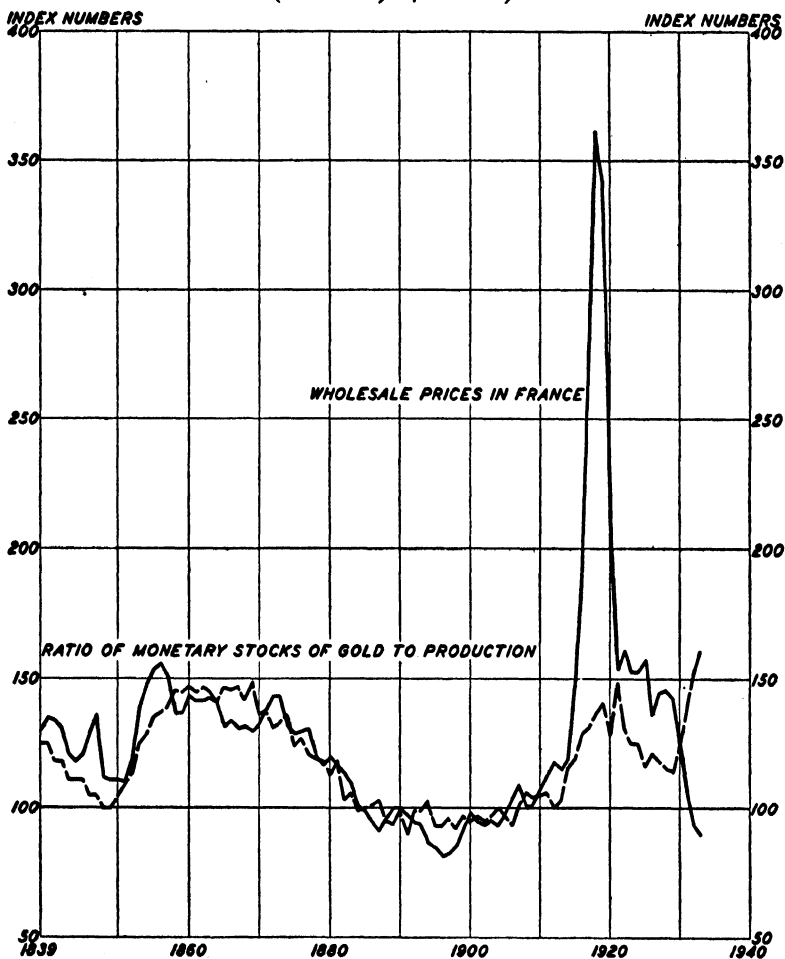
volume of production.¹⁹ Since the size of the monetary circulation depends on monetary policy as well as on gold production, this chart tests a wholly different hypothesis of price-money relationship from the main

¹⁸ *Gold and Prices*, Figure 5, p. 139.

¹⁹ In this case paper prices were used for the period when gold redemption was suspended.

thesis of the book. To the extent that the parallelism of curves on this chart proves anything, it shows that gold

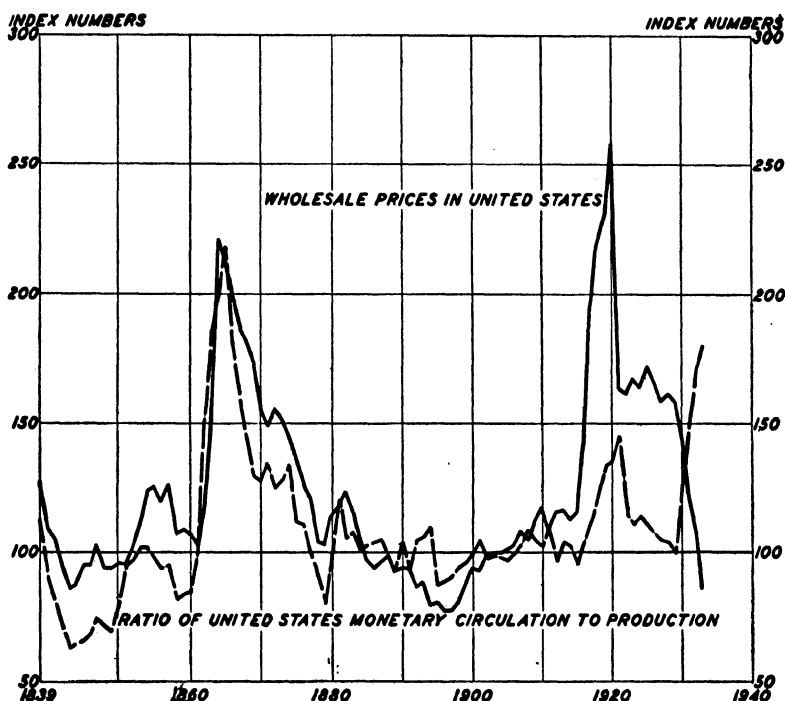
RATIO OF WORLD MONETARY GOLD STOCKS TO WORLD
PHYSICAL VOLUME OF PRODUCTION COMPARED
WITH WHOLESALE PRICES IN FRANCE, 1839-1933
(1880-1914=100)



stocks control prices not directly, but through the limitation which they put on the expansion and contraction of paper currency. If this is true it follows that changes

in financial organization and monetary policy may be as significant price factors as changes in the gold supply. Should Warren and Pearson consistently take the posi-

RATIO OF UNITED STATES MONETARY CIRCULATION TO
UNITED STATES PHYSICAL VOLUME OF PRODUCTION
COMPARED WITH WHOLESALE PRICES IN THE
UNITED STATES, 1839-1933
(1880-1914=100)



tion which is implied in this chart and the accompanying discussion, their doctrine would lose its unique character and become a variant of the quantity theory of money which has been expounded by innumerable writers over the past 100 years. But at most points they argue that the price level depends upon the production of gold and is not subject to control by manipulation of the vol-

ume of credit currency that is pyramided on the gold supply. They do not seem to see that their theory that prices depend on the gold supply is not fortified, but contradicted, by the evidence submitted on page 139 of *Gold and Prices* to the effect that prices are dependent on the total monetary circulation.

Another comparison is that between the ratio of Snyder's bank credit series to commodity production and his "general price level."²⁰ Concerning this comparison the authors say: "It is evident that credit had to expand more rapidly than production in order to keep this price level stable. The authors' chart, which is reproduced on page 141, does not seem to support the conclusion. In the periods when both curves are rising, the credit-production curve rises more rapidly than the price curve, but for the period of comparative stability of prices, 1875-1900, the credit-production line does not rise. In general this chart shows at least as high degree of correspondence between its component curves as do the other charts, though it relates to a still different theory. The introduction of bank credit into the analysis makes the theory under scrutiny identical with the conventional "quantity theory of money." It completes the break with the gold-supply theory which is foreshadowed by the introduction of the chart reproduced on page 139. If the implications of the chart on page 141 are valid, gold is only an indirect factor in price determination. Credit policy is the dominating factor, and the correspondence between gold and price movements shown in the earlier charts was accidental, in the sense that it depended on the maintenance of stability in the ratio of underlying gold stocks to the volume of bank credit which was pyramided on it.

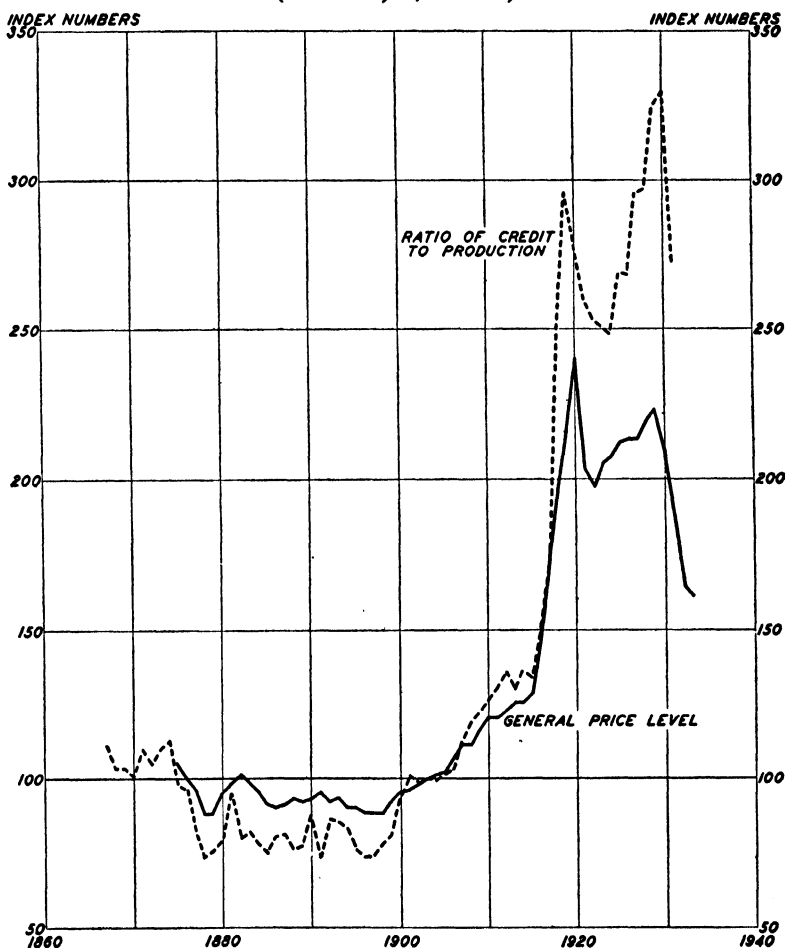
²⁰ *Gold and Prices*, p. 144.

PRE-WAR GOLD-PRICE RELATIONSHIPS 141

Another comparison offered is that between commodity prices in the United States and the ratio of the

RATIO OF SNYDER'S BANK CREDIT TO PRODUCTION COMPARED WITH SNYDER'S "GENERAL PRICE LEVEL,"

1860-1933
(1880-1914=100)



world's gold production to world monetary stocks 13 years earlier. The chart is reproduced on page 143. This comparison leads the authors to the following conclusion:

Since excessive production piles up stocks, it has a cumulative effect on prices. Since deficient production results in a cumulative deficiency in monetary stocks, the decline in commodity price lags behind the change in production.²¹

This analysis is similar to the one discussed on pages 134-36, and the fit of the curves is about the same. The comparison of prices with the movement of production at an earlier date is not illogical, since the existing stock is very large relative to annual production and a considerable time is required for changes in the rate of production to exert an appreciable influence on the monetary gold supply.

The comparison between *total* production and *monetary* stocks is anomalous. The proper comparison is either between total gold stocks and total gold production, or else between monetary stocks and the amounts added to those stocks.²² However, the results would not be changed greatly if either of these methods were used.

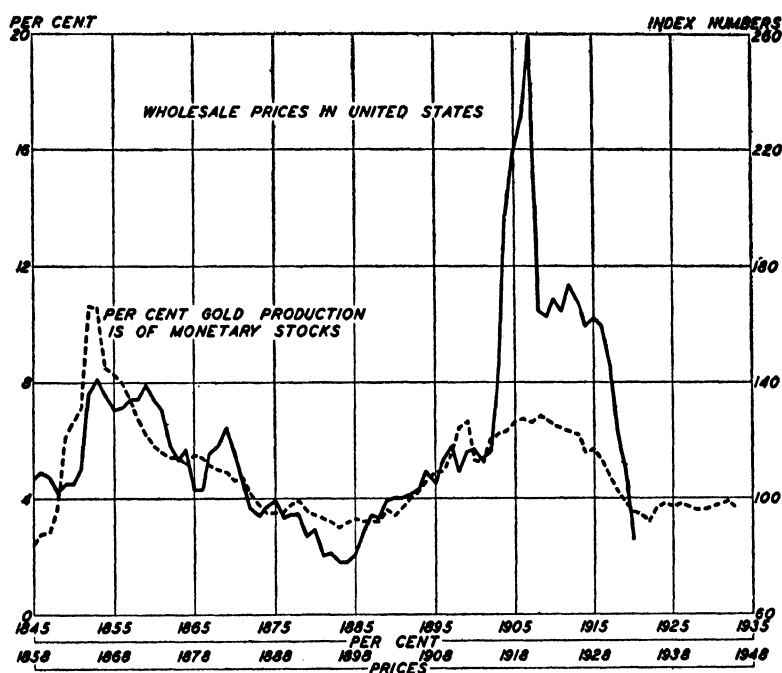
The comparison adds nothing to the convincingness of the analyses discussed on pages 134-37, which were based on changes in the size of the monetary stock instead of changes in the rate of gold production, since it

²¹ The same, p. 132.

²² Warren and Pearson bridge the gap between the two ideas by saying that to maintain stable prices (once the world had a gold supply large enough to sustain the existing price level) an increase of 3.15 per cent in monetary gold stocks was necessary, that being the average rate of growth of commodity production, and that since on the average 56 per cent of gold production is added to monetary stocks, the production of gold had to be 5.6 per cent of monetary stocks (since 3.15 is 56 per cent of 5.6). This reasoning would be justified if the ratio of gold production to the amount of gold added to monetary stocks were consistent, but that was not the case: the proportion of the world's gold output which went into monetary stocks was much higher in the decade of the fifties than in later years. According to Kitchin, in the decade of the fifties, 77 per cent of the new gold went into monetary stocks; in the sixties 49 per cent; in the eighties only 33 per cent. Hence, Warren and Pearson's ratios for the fifties are not comparable with their data for later years.

is obvious that the channel through which changes in gold production influence the movement of prices must be through their effect on the rate of accumulation of monetary gold stocks.

PERCENTAGE THAT THE WORLD'S GOLD PRODUCTION IS OF
MONETARY STOCKS COMPARED WITH COMMODITY PRICES
IN THE UNITED STATES THIRTEEN YEARS LATER,
1845-1933
(1880-1914=100)



The method employed in all these comparisons is unsound, and the conclusions are much more sweeping than the evidence justifies. The method consists in choosing a single factor which is believed to have some relationship to the price level, and making statistical comparisons to see whether this factor completely explains the actual movement of prices. Since other factors are

known to play a part in price determination, the most that such a comparison could prove would be that all these other factors cancelled each other during the period of observation.

No one questions that under a pure gold standard, not complicated by changes in monetary laws and banking practice, or by the credit control now exercised by treasuries and central banks, changes in the world supply of gold and in the volume of trade would be the chief factors determining the larger fluctuations of the price level. Historically, there never was a pure gold standard of this kind, but the pre-war standard was much closer to it than was the post-war gold standard, first, because the total amount of currency was more closely tied to the size of the monetary gold stock, and second, because there was a closer connection between the volume of monetary reserves and the total volume of purchasing media (including bank deposits). Consequently, conclusions drawn from pre-war experience are not safe guides to post-war policy.

However, even for the pre-war period Warren and Pearson overstate the closeness of the gold-price relationship. Their use of the ratio of monetary gold stocks to the world production of basic commodities implies that there was no significant change in the amount of gold needed to finance a given volume of world production at a given price level, and that consequently the only important factors in determining the trend of prices were the trend of gold production and the trend of the production of commodities. In fact, the amount of gold needed to finance a given price level was continually being pushed upward by the successive adoption of the gold standard in one country after another, while at the

same time it was being pushed downward by the increase in the use of paper currency and by the growth of commercial banking. Other less important factors were also operating to change the quantity of gold needed to finance a given volume of basic production at given prices. For example, the amount of trade and secondary production was undoubtedly increasing in proportion to the amount of basic production, and there was probably some change in the proportion of trade financed by offsetting credits without the use of a medium of exchange.

If in a selected series of years the relationships between gold, basic production, and prices remained substantially unchanged, it was merely because of an accidental offsetting of these factors. What the Warren-Pearson curves show is that during some periods they did substantially offset each other and that for other periods they did not.

A serious omission is the failure to make allowance for the effect of wars on the price level. From the close of the Napoleonic war until about 1850 the western world enjoyed a prolonged period of peace, and wholesale prices displayed a marked downward trend, interrupted only by speculative booms. The fifties and sixties were marked by a succession of wars, including the Crimean war, the American Civil war, the Franco-Italian war, and the successive conflicts of Prussia with Denmark, Austria, and France. This period coincided with the great increase of gold production incident to the Australia and California discoveries. After the Franco-Prussian war there followed three decades of peace, and also of relatively declining gold production, accompanied by falling prices. The period of rising prices after 1896 was marked by a great increase in gold produc-

tion. It was also the period of the Boer war, the Russian-Japanese conflict, the Balkan wars, and finally the World War.

The most striking change in gold prices during the period was the accompaniment of the World War and in this case the changes in the gold supply were relatively insignificant. The same thing can be said for the period of the Napoleonic wars. Statistically speaking, therefore, a case can be made for the theory that price trends are dominated by the alternations of war and peace which is just about as convincing as the case for explaining them exclusively in terms of the gold supply. For some periods, one explanation fits better than the other; for others, the reverse is the case.

This is not an attempt to prove that price trends are exclusively determined by the alternations of war and peace. Other factors than the two just mentioned have also played a part.²³ Any analysis based on a single factor when others are known to be present is inadequate.

Statistical comparisons between selected factors yield no information as to the importance of the omitted factors or the probability that they will continue to cancel each other. Of course, if the correspondence between the selected factor and the movement of the price curve was very close, and continued for decade after decade, it would create a strong presumption that any independent factors thus cancelled were of minor significance. Since, however, the factors ignored in the gold-price hypothesis are such major items as a great expansion of monetary and credit circulation relative to the gold base, and the adoption of the gold standard successively by half of the countries of the civilized world, and since the correspondence between the curves is irregular and inter-

²³ Compare p. 15.

mittent, the only possible conclusion is that in the periods selected for emphasis by Warren and Pearson there was an accidental cancellation of highly important factors operating on the demand for gold. This conclusion is implicitly conceded, as we shall see, by the authors' treatment of the post-war era, in which the pre-war coincidences were not repeated, and the pre-war gold-price relationship did not recur.

CHAPTER IX

THE POST-WAR SITUATION

For the war years and the decade following, Warren and Pearson make no claim that the movement of prices corresponds to changes in the ratio of the monetary gold supply to the volume of production of other things. The charts on pages 135 and 137 make this lack of correspondence perfectly obvious. Neither the wartime peak, the decline of 1921, the relative stability of the "New Era," nor the collapse of 1930-33 reflects any corresponding changes in the production or monetary supply of gold. Indeed, the decline of 1920-21 occurred at a time when gold production was higher in proportion to monetary stocks than it had been since the fifties of the preceding century. Total stocks of gold were lower in proportion both to prices and to commodity production than before the war, but higher than in the prosperous period of 1922-29.

The authors' hypothesis is that the war-time and post-war failure of prices to follow the changes in supply resulted from abrupt changes in the monetary *demand* for gold. With regard to 1915-20 they say¹ that prices were high in the gold-using countries because most countries had discontinued the use of gold, so that it moved in relatively large volume to the places where there was a monetary market for it; and also because governments were buying large amounts of commodities in the early stages of their passage through the channels of trade, and completing their passage to soldiers or to Europe without the use of money. Governmental and

¹ *Gold and Prices*, pp. 104-6.

private hoarding of goods is said to have contributed to high prices.

It is true that many nations discontinued the use of gold during the war and that it flowed from belligerent to neutral countries in payment for necessary imports. Granting that the lessened demand for gold affected its value, such an explanation of the wartime price increases is clearly inadequate, since it completely ignores such factors as the wholesale expansion of credit.²

The price collapse of 1921 is given little consideration. In one place, however, Professor Warren quotes from his own "price forecast" of February 1919 as follows: "As the volume of currency is contracted prices will fall. . . . The rate of drop in the general price level depends primarily upon the financial policy that is followed. Ordinarily the period when currency of all kinds would be at its maximum would be expected to come within a few months after the floating of the last government loan."³ Here the contraction of credit is regarded as of primary importance—which would suggest that the preceding credit expansion was largely responsible for the war-time price inflation.

² In an earlier publication Warren and Pearson, referring to the fact that in the United States from 1919 to 1920 prices were higher than the gold supply would suggest, said: "In that period the government held down interest rates in order to sell the Victory Loan at a low rate of interest. This resulted in a great expansion of credit so that the large gold supply was more than fully used." ("Wholesale Prices in the United States for 135 Years, 1797-1932," *Cornell University Agricultural Experiment Station Memoir* 142, 1932, p. 62.) This line of reasoning is not used at all in the discussion of the relationship of gold supply to prices in the volume which we are reviewing.

³ *Gold and Prices*, p. 108. With reference to the period from 1921 to 1929, there is an obscure passage in *Prices* (p. 114) as to the causes of price changes, but this is omitted in *Gold and Prices*, and nothing is inserted in its place—though the caption of the preceding paragraph, which deals with 1915-20, is changed in the later book to refer to 1915-29.

With regard to the post-war decade, the most relevant passages are the following:

The attempt of all the gold-using world to return to a gold basis caused a collapse. England and other countries made the mistake of thinking that they could go back on the gold basis by deflating to the level of prices in the United States. They did not realize that this increased demand for gold would lower prices in both countries.⁴

The low value of gold and resulting high prices from 1916 to 1928 were due to low demand for gold for monetary uses. The gold panic of 1929 and the collapse of the price structure were due to a sudden world-wide return of the demand for gold.⁵

The first question suggested by these passages as an explanation of the price collapse of 1929-33 is: If the demand for gold caused by the adoption of gold standards is of such crucial importance, why did it never register itself as a factor worthy of the authors' attention in their study of the 75-year period before the war? Certainly there were extraordinary changes in the monetary demand for gold in those years. If the abandonment and re-adoption of the gold standard could so completely dominate the price situation in the post-war era, why was not the relationship of gold supply to prices obscured by the original adoption of the gold standard by the Scandinavian countries in 1872, by Germany in 1873, by Holland in 1875, by many other countries in the same general period, and by its re-adoption by the United States in 1879? And if the re-adoption of the gold standard in 1923-28 caused the price collapse of 1929-31, why did not the subsequent abandonment of gold standards at least prevent further decline in 1931-33?

⁴ The same, p. 106.

⁵ The same, p. 107.

The second difficulty with the authors' explanation of the post-war history of prices is more serious. The explanation does not square with the history of the stabilization process. There occurred in 1929 no such sudden world-wide return of the demand for gold as the authors suppose. The return to the gold standard had been going on steadily since 1923 and, with the exception of France, the countries which went back to the gold standard had completed the process of rebuilding their reserves before 1929.

The monetary history of this period breaks very definitely into three parts: first, the years when the United States was the only important country on the gold standard, from 1919 until the stabilization of the German mark in October 1924 (Austria and Sweden stabilized in 1923); second, the period of rapid restoration of the gold or gold-exchange standard all over Europe, from the autumn of 1924 until the summer of 1928; and third, the period from the middle of 1928 to the end of 1929, when there occurred changes in the policy of the Federal Reserve Board and the Bank of France which were far more important in the effect on the gold-credit situation than were any demands arising directly out of stabilization programs.

For the first of these periods the Warren-Pearson theory that the value of gold was being influenced by the accumulation of stocks of gold in preparation for the restoration of the gold standard is entirely erroneous. There were no important accumulations in countries which were preparing to restore gold. On the contrary, European countries off the gold standard were shipping gold, especially in 1919-20, to the United States, to Japan, to the Argentine, and to Brazil. None of these countries was accumulating gold with a view to restor-

ing the gold standard. During the second period, 1924-28, there was some demand of the sort that Warren and Pearson visualize, though, as we shall show, it is not likely that it had any important influence on commodity prices. For the third period, 1928-29, the world credit situation was dominated by the policies of France and the United States. The Warren-Pearson characterization fits the French part of the story fairly plausibly, but the American policy, which was the most important factor in the so-called "demand" for gold, must be explained in a totally different way.

Depreciated currency, 1919-24. The first price collapse, that of 1920-21, came before any important country except the United States had returned to the gold standard. It was preceded by a large-scale movement of gold from Central Europe to the United States, and to other countries outside the former war zone, notably Argentina, Brazil, and Japan. This movement went on throughout the depression of 1920-21 and the price recovery of 1922. As the table on page 153 shows, the commercially important overseas countries accumulated gold steadily until the restoration of the gold standard in Europe began with Germany in 1924. The factors determining the direction of international gold flows were similar to those which controlled during the war, except that shipping conditions now made it possible for Europe to draw on a greater range of sources for its necessities. Partly to liquidate old debts and partly to replace depleted stocks of food and raw materials, Europe exported gold at the same time that she incurred vast new foreign debts. Overseas countries enjoyed an export boom which lasted until the credit resources of Europe no longer sufficed to finance the one-sided trade. In the process, the bulk of the new gold of South Africa

and the old hoards of Russia and Germany went, directly or indirectly, to finance the movement of goods out of the countries which came out of the war era with an exportable surplus and with relatively unimpaired productive capacity.

It will be seen, therefore, that this period cannot properly be described as one in which the accumulation

GOLD HOLDINGS OF CENTRAL BANKS AND GOVERNMENTS, 1918-24^a
(In millions of dollars; converted at par of exchange)

Country	1918	1919	1920	1921	1922	1923	1924
United States ^b	2,658	2,518	2,451	3,221	3,506	3,834	4,090
Japan ^c	226	350	556	611	606	602	586
Argentina ^d	304	337	474	472	473	466	444
Canada ^e	130	130	113	95	147	127	151
Australia ^f	104	117	115	113	116	121	121
Brazil ^g	26	26	33	43	46	49	54
Chile ^h	23	24	33	34	34	34	34

^a Compiled from table in *Federal Reserve Bulletin*, April 1930, p. 171.

^b Treasury and Federal Reserve Banks.

^c Domestic holdings of Bank of Japan and of government.

^d Government conversion fund and Bank of the Nation.

^e Government reserve against Dominion notes and savings-bank deposits, and gold deposits of chartered banks in the central reserve.

^f Commonwealth Bank note reserve.

^g Bank of Brazil and government stabilization fund.
Government conversion fund.

of gold in preparation for the restoration of the gold standard was responsible for any increase in the value of gold that may have occurred. There was no large accumulation in any European country that was off the gold standard, except England, and none there after 1920. The dominating factor was the flow of gold into the countries whose resources had been least depleted and whose industrial organization least demoralized by the war. And certainly the price collapse of 1920-21 (the most rapid change in gold prices on record) was not precipitated by any change in the demand for gold.

Restoration of the gold standard, 1924-28. For the

second period, the story is very different. This is the period of the successive restoration of the gold standard in most of the countries of Europe. These stabilization programs did involve some genuine increase in the demand for gold in France and in Germany. As the table on page 156 shows, the changes which occurred in the gold holdings of the other countries which stabilized their currencies during that period are wholly insignificant in comparison with the annual output of gold and the volume of gold stocks.

However, whether the restoration of the gold standard involved any such pressure on the world's gold supply as might tend to depress prices cannot be determined merely by study of the changes in the gold stocks of the stabilizing countries: it depends also on the availability of a supply of gold in other countries and the difficulty of getting it away from its holders.

The bulk of the gold which went into the reserves of the new gold-standard countries came from new gold production and from the reserve of the Federal Reserve system, and its accumulation did not in fact involve any credit strain or cause the price repercussions which might have been expected. For years it had been a commonplace of monetary discussion in the United States that the gold which came in just after the war would return to Europe when it was again needed to support gold-standard currencies in Europe, hence could not safely be built into our own credit structure. The reserve ratio ceased to be a guide to credit policy after 1920. The excess reserves of the Federal Reserve Banks on September 30, 1924, just before the stabilization of the German mark, amounted to 1,666 million dollars, and the reserve ratio was 79.5 per cent. Consequently the United States could and did release gold without any

curtailment of its credit pyramid. In the first half of 1925 we lost 140 million dollars worth of gold, and in the 14 months which ended in May 1928 we lost nearly 540 million dollars.⁶ The first outflow furnished much of the basis for the new gold currency of Germany and the second for that of France, and in both cases the open-market policy of the United States was such as to neutralize the effect of the gold outflow.⁷

Under these conditions, and since none of the other powers that were already solidly on gold was making an effort to absorb the product of the mines, the fresh demand for gold which appeared in connection with stabilization programs was satisfied without the necessity for any contraction of monetary purchasing power in the world at large. The gold reserves of the Federal Reserve Banks served just as effectively to support the American price structure in 1926 as they did in 1924, and would have served just as effectively in the middle of 1928 as in the middle of 1927, had it not been for the appearance of the stock-market issue which is discussed below. The United States gold which went into the reserves of the Reichsbank and the Bank of France was drawn out of unutilized resources almost as effectively as though it had been disgorged from the mines of South Africa.

Credit contraction, 1928-29. In the third of the periods into which we have subdivided the interval between the war and the oncoming of the depression, the dominating fact was not the establishment of gold standards: that process was nearly completed and no sign of gold shortage had appeared. But the picture was com-

⁶ Compare table on p. 156.

⁷ Compare Charles O. Hardy, *Credit Policies of the Federal Reserve System*, 1932, Chap. IX.

**NET CHANGES IN GOLD HOLDINGS OF LEADING CENTRAL BANKS
AND GOVERNMENTS BETWEEN 1924 AND 1928***

(In millions of dollars; converted at par of exchange)

Country	Holding		Change
	December 31, 1924	December 31, 1928	
European:			
Austria.....	2	24	+ 22
Belgium.....	53	126	+ 73
Czechoslovakia....	27	34	+ 7
Denmark.....	56	46	- 10
France.....	710	1,254	+544
Germany.....	181	650	+469
Great Britain.....	757	750	- 7
Hungary.....	7	35	+ 28
Italy.....	218	266	+ 48
Norway.....	39	39	-
Poland.....	20	70	+ 50
Sweden.....	64	63	- 1
Switzerland.....	98	103	+ 5
Non-European:			
Argentina.....	444	607	+163
Australia.....	121	108	- 13
Brazil.....	54	149	+ 95
Canada.....	151	114	- 37
Chile.....	34	7	- 27
India.....	109	124	+ 15
Japan.....	586	541	- 47
Java.....	54	68	+ 14
South Africa.....	53	39	- 14
United States.....	4,090	3,746	-344

* *Federal Reserve Bulletin*, April 1930, p. 171. Figures are for central banks only, except in the following countries: United States—Treasury and Federal Reserve Banks; Argentina—government conversion fund and Bank of the Nation; Australia—Commonwealth Bank note reserve; Brazil—Bank of Brazil and government stabilization fund; Canada—government reserve against Dominion notes and savings-bank deposits, and gold deposits of chartered banks in the central reserve; Chile—prior to 1926 government conversion fund and subsequently Central Bank of Chile; Czechoslovakia—prior to 1926 banking office of Minister of Finance and subsequently Czechoslovak National Bank; England—Bank of England and, prior to 1925, government reserve against currency notes; India—currency and gold standard reserves of government; Italy—prior to July 1926 three banks of issue and subsequently Bank of Italy; Japan—domestic holdings of Bank of Japan and government; South Africa—South African Reserve Bank.

pletely changed by the initiation of new policies on the part of the Federal Reserve system and of the monetary authorities of France. These new policies may be summarized by saying that France stabilized her currency and continued to enlarge her gold reserves at the same time that the United States, for reasons which had nothing to do with the desire to hold gold, ceased to make its gold reserve freely available to the world.

Let us consider first the case of the United States. In 1928 the authorities of the Federal Reserve system undertook to check a stock-market boom which had been in progress for four years, by raising rediscount rates and selling out the securities owned by the Federal Reserve Banks. From December 31, 1927 to June 30, 1928, holdings of government securities were reduced from 617 million to 235 million dollars. Rediscount rates, which were $3\frac{1}{2}$ per cent at all banks at the end of 1927, had been advanced by March 1 to 4 per cent at all banks, by June 7 to $4\frac{1}{2}$ per cent, and by August 1 at eight banks to 5 per cent. In the last half of 1928 the pressure was slightly relaxed, but in the spring of 1929 still more drastic restrictive measures were taken. Rates were raised at the remaining four banks. The small holdings of government securities were further reduced, and much pressure was brought to bear on individual commercial banks to refrain from expanding their stock-market loans.

As has usually been the case, the gold movement was slow to respond to the change of policy. The outward flow of 1927 continued through the spring of 1928 in spite of credit restriction, but in the last half of the year the outflow ceased and in the first half of 1929 there was an inflow of 220 million dollars. This gold did not come in because the Federal Reserve authorities were concerned about the loss of gold; and much less because

they had any interest in scrambling for the gold stocks of other nations. It came in simply because the attempt to make money expensive for stock-market speculators inevitably made New York an attractive market for the floating short-term money of the world, and the resulting demand for New York funds drove the value of the dollar in foreign markets so high that it paid to buy gold abroad, ship it to the United States, and sell it for dollars to lend in New York. It is mere juggling of words to call this action an expression of an increased demand for gold. In fact, the inflow of gold at this time was a source of much embarrassment to the Federal Reserve system, since it made the banks less responsive to changes in Reserve system policy.

At about the same time that this policy was initiated, the gold standard was officially restored in France.⁸ This action did not of itself require any increase in the gold reserves of France. As was noted above, the Bank of France had been collecting gold stocks for years; its reserves, both of gold and of gold-standard currencies, were ample to safeguard the stability of the franc. Toward the end of the era of unstable money, the anticipation of stabilization, however, brought about a big flow of short-term money into France, largely the balances of French citizens which had been sent abroad during the era of depreciation. French imports of merchandise did not expand correspondingly; consequently it was necessary for the Bank of France either to absorb corresponding amounts of foreign money thus offered in exchange for francs, or else to require the importers of short-term capital to furnish actual gold in exchange for the francs they wanted.

During the period when short-term money was mov-

⁸ The franc had, in fact, been kept stable since the beginning of 1927.

ing most rapidly into France the Bank accepted all the foreign exchange that was tendered it, but exchanged for gold a part of the stock of foreign bills which it was acquiring. Such absorption of gold, so the Bank contended, was the only way in which to prevent the development of a world-wide credit inflation, since any other policy would maintain in foreign money markets an artificial monetary ease that would permit them to continue buying francs indefinitely without any corresponding reduction in their available funds.⁹

Legal stabilization checked this inflow of foreign short-term money. The policy which the Bank pursued during the next two years varied considerably and its reasons are somewhat obscure. In the last half of 1928 less than 35 million dollars of gold was imported. In the first half of 1929, however, the Bank converted its foreign exchange into gold to the extent of nearly 100 million dollars, and during the second half of the year there was a further large acquisition of gold without any corresponding reduction in the foreign-exchange portfolio. The reasons for the gold imports in the first half of the year were never explained by the Bank: there are indications that they were in large part motivated by political considerations which had nothing to do with the maintenance of the gold standard. Pressure on the German money market was apparently used as a diplomatic weapon in connection with the negotiations which led to the Young Plan.¹⁰ The inflow of gold into France in the last half of 1929 was avowedly not on the

⁹ *Annual Report of the Bank of France*, 1928, reproduced in *Federal Reserve Bulletin*, March 1929, p. 202.

¹⁰ Compare Paul Einzig, *Behind the Scenes of International Finance*, Chap. VI; *Annual Report of the Reichsbank*, 1929, reproduced in *Federal Reserve Bulletin*, May 1930, p. 298, where it is stated that foreign funds were withdrawn from Germany "in part deliberately."

initiative of the Bank of France, but a resultant of the play of complex forces determining the international exchange rates.¹¹ Presumably the French monetary authorities could have checked them by sufficiently vigorous measures of credit expansion, but there were certainly no overt acts which could be cited as evidence of a desire to accumulate gold.

Nominally, rediscount rates at the Bank of France were kept low throughout, while other countries were following the lead of the Federal Reserve system in raising rates. Theoretically these low rates should have led to the creation of an abundance of franc currency, and stimulated, among other things, private French purchases of the foreign short bills which the Bank of France was selling, and of foreign long-term securities. But the Bank of France does not practice open-market operations and the volume of eligible bills to which the rate applied was not large. Hence (and perhaps for other reasons) the low rates did not in fact lead to any considerable credit expansion. No real market for foreign securities had been developed in France since the war. Thus the sale of the foreign bills and deposits held by the Bank of France and its purchases of francs led to the movement of gold into France, and this gold was virtually put into circulation in the form of notes backed by gold.

Whatever the purpose of the Bank's policy, the combination of French pressure on the money markets of London and Berlin and Federal Reserve pressure on that of New York was to create a strong pull on the gold supplies of the rest of the world. In 1929 France gained 379 million dollars in gold and the United States 254

¹¹ *Annual Report of the Bank of France, 1929*, reproduced in *Federal Reserve Bulletin*, March 1930, p. 112.

million. And, meanwhile, nearly every other central bank in the world took steps to protect its reserves by tightening its domestic money market.

Superficially what happened may be called an increased demand for gold. Certainly the central banks of the world refused to stand by and let their reserves be drawn off to France and the United States. To this extent Warren and Pearson are right, although they are wrong in attributing the pressure to the restoration of the gold standard. But the situation was not the result of inadequacy of gold to support credit and currency, nor of any sudden increase in monetary demands—except perhaps, as has been stated, in France. It is safe to say that the question whether the world's monetary gold stock amounted to 8 billion dollars or 16 billion dollars was wholly irrelevant to the developments of 1928-29. Certainly the policy of the Federal Reserve Board would not have been affected by the possession of a much larger stock of gold. For seven years the credit policy of the Reserve system had been deliberately and painstakingly dissociated from the gold-reserve situation. Money was tightened in 1923 and 1928 without any purpose of attracting gold imports and was eased in 1924, 1927, and 1930 without reference to the probability of resulting gold exports.

The case of Great Britain is not quite so simple. In the whole period from 1925 to 1931 the credit policy of the Bank of England was dominated by the popular belief that the British business situation, and especially the unemployment situation, required the most liberal credit policy that could be maintained consistently with the maintenance of the gold standard. If consistently followed, such a policy meant that gold would never be

allowed to accumulate in England in significant amounts, but that, on the contrary, money would be eased whenever there appeared a surplus of gold stock above the working minimum that had been agreed upon. A country which regards the appearance of any surplus in its gold reserves above a fixed minimum as a signal for cheaper money is bound to lose such a surplus very quickly, unless other countries pursue a similar policy, and it is forced to resort to restrictive measures to protect that minimum as soon as any other important country begins to contract its credit structure.

Under these conditions the amount of gold in the world in 1928-29 was really irrelevant. Undoubtedly the credit policy of the Bank of England could and would have been more liberal for a time if the British gold reserve had been larger. The result, however, would have been simply to drive out of Great Britain the surplus gold stock above whatever figure was taken as a working minimum, after which the shortage would have become chronic. And the fact that the London money market was full of foreign balances made the situation always precarious.

As to the minor countries, there is no reason to think that their reaction to the situation precipitated by the policies of Washington and Paris would have been different if their gold supplies had been larger. These countries tightened their money markets in 1929 lest their reserves be sucked into the New York money markets. The international gold standard makes it practically necessary for small countries to follow where their more powerful neighbors lead. If they do not tighten their money when the larger countries do so, they may lose their entire reserves without much effect on the situation in the larger neighbors' markets; if they do not ease their markets

when their more powerful neighbors do so, they are likely to be swamped with gold.

In short, what happened in 1928-29 was that central banking policies of the world which for four or five years had, on the whole, been directed toward easy money conditions, shifted in the direction of tight money because of a stock-market boom in America, and because the Bank of France believed it had too large an investment in foreign short-term money markets. An easy-money central-bank policy repels gold and conversely, a tight-money policy attracts it; but there are other reasons for an easy-money policy besides a desire to repel gold and other reasons for tight money besides a desire to hoard gold.

As for the further price declines of 1931-33, gold shortage is one of the least plausible of the many explanatory hypotheses that have been advanced. In 1931 there was a general scramble for gold. The abandonment of the gold standard by Great Britain resulted in heavy losses for continental central banks, because sterling deposits and sterling bills had been favorite investments of central banks. The safest and easiest way in which these countries could withdraw their investment from the British money market was to take it home in gold. Hence there was a temporary increase in the demand for gold.

However, this increased demand for gold appears to have been a minor factor in the price declines of 1932. Under the modern gold standard, gold functions almost entirely as reserve material for central banks, and central bank deposits are reserve material for commercial banks. Gold is now practically everywhere out of use as coin. A shortage of gold, if it is to have any price significance, must express itself in a shortage of commercial or central-

bank reserves. But throughout the later stages of the depression, reserves have been superabundant, and especially so in the United States.

Even genuine changes in the demand for gold cannot dominate the price situation as they might if the connection between gold reserves and actual means of payment were still as close as it was in the pre-war era. What Warren and Pearson have overlooked is the rise of central banking systems which cut the connection between gold on the one hand, and money or bank deposits on the other. The development of these systems, which began long before the war but has been greatly accelerated since, has introduced a large subjective element into the determination of every country's "need" for gold. So long as credit policy is dissociated from the size of the world's gold stock, the gold stock is of no real significance in determining the price level. Credit policy has been so dissociated from gold in the United States and, to a less extent, in France—the two principal holders of gold.

CHAPTER X

DEVALUATION AND PRICES, 1933-34

Professors Warren and Pearson contend that the changes in prices in the United States since the abandonment of the gold standard, particularly in 1933, confirm their theories of the way in which price changes are related to changes in the value of gold and in the quantity of gold nominally represented by the currency unit. As a preliminary to our discussion of their argument on this point, it may be helpful to review very briefly the story of what happened to currency and to prices in the United States in 1933.

In the beginning, the abandonment of the gold standard was incidental to the banking crisis of March 1933. The restrictions which were placed on gold redemption and export by Presidential proclamation in that month did not result in any substantial depreciation of the dollar against foreign currencies. Gold was obtainable under license for international transactions and was in fact released by the Treasury in sufficient amounts so that international settlements were not seriously obstructed. On April 20, however, the President made formal announcement that the suspension of the gold standard was more than a mere temporary concession to the necessities of the crisis. The embargo on gold exports was made more rigid and the release of gold from the monetary stocks of the government and the Federal Reserve Banks was definitely terminated. From that date the foreign exchanges reflected a rapid depreciation of the dollar.

On the same day (April 20) there was introduced in Congress an amendment to the farm relief bill, which

became Title III of the Agricultural Adjustment Act, approved May 12. This amendment included several important monetary provisions. The President was given power to fix the gold content of the dollar at any number of grains he might see fit, provided that the existing legal weight was not reduced by more than one-half. He was also empowered to fix the weight of the silver dollar at any ratio to the gold dollar he might deem appropriate, and to provide for unlimited coinage of both metals into legal-tender money.

On July 3 the President sent to the World Monetary and Economic Conference a message in which he stated definitely that the United States government had no immediate intention of stabilizing the dollar against gold or gold currencies. He said:

The United States seeks the kind of dollar which a generation hence will have the same purchasing and debt-paying power as the dollar value we hope to attain in the near future. That objective means more to the good of other nations than a fixed ratio for a month or two in terms of the pound or franc.

For the next three months the exchange value of the dollar was left to the play of trade and speculative forces without official control. It fluctuated widely but showed no pronounced trend either upward or downward.

On October 22 the President announced by radio a new policy which was strongly endorsed, if not originally suggested, by Professor Warren, who was then one of the President's chief monetary advisers. In this address the President reiterated the definite purpose of the Administration to raise commodity prices further, and to maintain the new level permanently. With this purpose in mind the United States was about "to take firmly into its own hands the control of the gold value of the dollar," that is, engage in buying and selling foreign ex-

change with a view to decreasing the purchasing power of the American monetary unit. In addition, the President announced the establishment of a government market for gold, to be administered by the Reconstruction Finance Corporation, in which gold newly mined in the United States would be bought "at prices to be determined from time to time, after consultation with the Secretary of the Treasury and the President."

The gold-purchase plan went into operation on October 25. For a few days operations were confined to domestic purchases of newly mined gold at progressively higher prices, but on October 29 the decision was announced to extend operations to foreign markets. The amount and character of operations carried on under the new policy were not made public, but the indications are that the gold purchases were sufficiently large to constitute a genuine control of the rate of exchange on gold-standard countries. On January 30, 1934 an act was passed authorizing the President to fix the weight of the currency, at his discretion, at any level between 50 and 60 per cent of its old gold value. Under this authority the dollar was *de facto* stabilized at 59 cents from February 1, by the establishment of a fixed price for gold of \$35 an ounce. No binding commitment with regard to the maintenance of this value has been made, but the dollar has in fact been pegged at a ratio to the French franc and the other gold-standard currencies within a narrow range around 59 per cent of the old parity.¹

The currency history of the period since we abandoned the gold standard thus embraces four distinct stages. The first was the period from March to October 1933, when there was no market for metallic gold, but a free market

¹ Early in 1935 the purchase and sale of foreign exchange was substituted for the trade in gold as a means of maintaining exchange stability.

for foreign exchange in which the dollar was left to find its own level under the combined influence of trade conditions and speculative anticipation of the course of monetary policy. The second was a four-day period when an attempt was made to control the value of the currency by buying newly mined domestic gold at arbitrary advancing prices. Third came the period when the government was buying gold abroad with a view to lowering the exchange value of the dollar: this experiment ended on February 1, 1934. Fourth came the period of *de facto* stabilization on a 59 per cent basis, continuing to the present time.

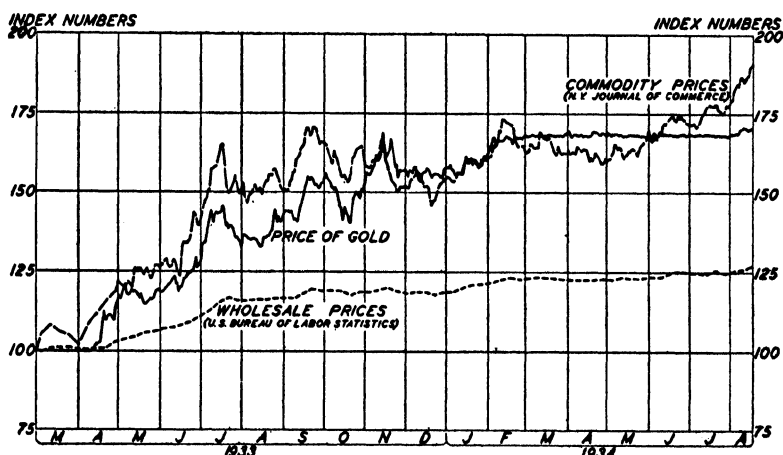
In discussing the effects of these policies on prices, Warren and Pearson place chief reliance, not on the general index numbers of wholesale prices which were used in the preceding discussion, but on the prices of so-called basic commodities, mostly raw materials. To compare American price movements with those of other countries, special indexes of identical basic commodities are used. For the United States, chief reliance is placed on the *New York Journal of Commerce* index of 30 commodities.

As is shown by the chart on page 169, the "basic commodity" index rose somewhat more rapidly than did the price of gold from March to November 1933, but the two curves did show a close parallelism in their fluctuations—close enough certainly to create a presumption that the change in the price of gold was reflected in the commodity index.² Averages of all wholesale prices cor-

² It seems probable that the simultaneous drop in the two curves in July 1933 reflects a reverse influence, commodity prices pulling down the value of foreign currency. In that month occurred a spectacular collapse in the speculative markets for cotton, grain, and stocks. This was largely independent of the foreign-exchange situation and operated to increase the purchasing power of the dollar and its value in foreign currencies.

responded much less accurately to changes in the monetary unit, as is shown by comparison with the Bureau of Labor Statistics index which we have added to Warren and Pearson's chart.

THE PRICE OF GOLD, THE JOURNAL OF COMMERCE INDEX OF PRICES OF 30 COMMODITIES, AND THE BUREAU OF LABOR STATISTICS INDEX OF WHOLESALE PRICES, MARCH 1933 TO AUGUST 1934^a
(February 1933=100)



^a Taken from *Gold and Prices*, p. 192, with the addition of the Bureau of Labor Statistics index of wholesale prices (converted to February 1933 base). The "price of gold" shown is computed throughout from the London price of gold bullion and the closing exchange rate of the pound sterling in New York.

This difference raises the question whether an index of so-called basic commodities or a wholesale index, or for that matter some other price average,⁸ is the best test of the effectiveness of monetary management exerted through manipulation of the gold content of the dollar. Here, as at other points in their analysis, Warren and

⁸ The cost of living and the so-called general price level showed even less correlation with the price of gold than did wholesale prices.

Pearson assume, without argument, that whichever piece of evidence best supports their case is the best test.

Our conclusion is that the fact that the so-called basic commodity index corresponds to the curve of the price of gold currency better than other price indexes is actually strong evidence against Warren and Pearson's fundamental doctrine. The issue is not whether the United States' policy of devaluing the dollar brought about a rise in these prices. The question is whether the correspondence is explained by the relationship between the value of gold as a commodity and the value of other things, or whether the important thing is the effect of the revaluation of foreign currency on the prices of commodities with international markets.

It is nowhere seriously disputed that devaluation of a currency unit affects prices directly through the revaluation of foreign exchanges,⁴ and may affect them also through its effect on the nominal volume of reserves available to support bank credit.⁵

Warren and Pearson contend, however, that the important fact is that gold prices are the expression of a direct comparison between the value of the metal gold and the value of other commodities. They do not discuss this question at any length, nor offer any statistical test of it; they merely say:

⁴ For a discussion of the influence of exchange depreciation on prices, compare Leo Pasvolsky, *Current Monetary Issues*, pp. 119-26; Charles O. Hardy, "Devaluation of the Dollar," *Public Policy Pamphlet No. 8*, University of Chicago Press, 1933, pp. 15-22.

⁵ In the case of the United States the volume of available bank reserves has been throughout the period of the currency experiment so much in excess of the amount actually utilized that the additions made possible by revaluation are of no current significance. In fact, as the devaluation program was handled, the increase in the dollar volume of gold in the country did not directly affect the volume of reserves of the Federal Reserve Banks or of the member banks, but was appropriated by the Treasury.

As will be noted from the list of farm products and other studies, prices of all basic commodities are affected; and they undoubtedly would be affected if there were only one country in the world and it raised the price of gold.

It is not necessary to wait for a foreigner to tell us that prices will change when the gold content of our money changes. Any modern people has sufficient intelligence to act at once when the gold content of its money is changed. In fact, it usually acts in anticipation of the change.⁶

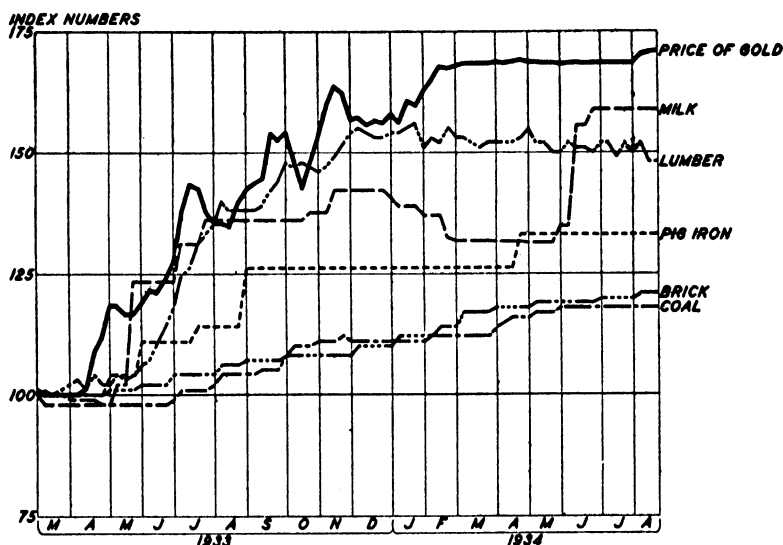
Examination of actual price movements fails to substantiate this conclusion. As we show below, the chief "basic" commodities which do not have international markets fail to reflect the exchange movements promptly or fully. It is strikingly true that the larger the proportion of international prices an index contains, the better it corresponds in its fluctuations to the so-called price of gold. This is the real significance of the difference between behavior of the "basic commodity" indexes and of the wholesale and retail indexes, for the *Journal of Commerce* index which Warren and Pearson call a basic commodity index might better be described as an index of the prices of commodities which have international markets. Its compilers do not use either designation. They call it simply a daily index of price changes. The list was made up by the *Journal of Commerce* for use in computing *daily* fluctuations in prices, and its components were presumably selected with a view to including commodities whose prices are subject to day-to-day fluctuations. But these are precisely the commodities which move most freely in international trade and come nearest to having what can properly be called international market prices. Among the 30 commodities included are nearly all the commodities which have such free markets that

⁶ *Gold and Prices*, pp. 194-95.

their price fluctuations in the United States correspond closely to those in other countries.⁷

As a sample of prices of commodities with international markets, the list is representative, but as a picture

THE PRICE OF GOLD COMPARED WITH THAT OF FIVE BASIC COMMODITIES^a
(February 1933=100)



^a Price of gold computed as indicated in note to chart, p. 169. The basic commodity prices are taken from the office records of the Bureau of Labor Statistics. Milk prices are the average for New York, Chicago, and San Francisco, weighted in accordance with estimated consumption. Lumber prices are the Bureau of Labor Statistics group index. Coal is mine-run bituminous. Pig iron is basic furnace.

of the prices of "basic" commodities it has conspicuous and inexcusable omissions. It does not include pig iron, milk, lumber, coal, or hay, and these are certainly as

⁷ The list is as follows: wheat, corn, oats, rye, barley, flour, beef, pork, lard, eggs, butter, cheese, sugar, coffee, cocoa, cotton, printcloth, wool, silk, burlap, copper, zinc, lead, tin, silver, hides, rubber, linseed oil, turpentine, and petroleum. On Apr. 18, 1934, hog prices were substituted for petroleum prices.

“basic” as most of the commodities which make up the list. They are not, however, as sensitive to varying day-to-day influences, and their markets are more restricted. Their price fluctuations show no such correlation with the price of gold, as is shown clearly by the chart on page 172.

Exchange manipulation is a well-known form of currency management, and is in no sense a Warren-Pearson discovery. The merits of such manipulation as a way to combat depression constitute a highly controversial question which requires separate treatment. Here we are concerned only with the peculiar Warren-Pearson variant of the managed-currency doctrine which holds that prices are made by a simple comparison of the commodity values of goods and of gold. We conclude that their own evidence gives strong support to the contrary position.

APPENDIXES

APPENDIX A

THE MYTH OF 1849¹

Without doubt the chief historical evidence in favor of the theory that the level of commodity prices is determined by the quantity of gold is the alleged upward trend in commodity prices during the 24 years following the discovery of gold in California. I say "alleged," for the purpose of this paper is to prove that there was no general upward trend of commodity prices in those years, and that the enormous increase in the quantity of gold that then took place did not reduce its purchasing power in terms of the commodities usually bought by the ordinary citizen.

Such a thesis seems bold. For over two generations the writers of economic textbooks and the Populist politicians have agreed that prices of commodities after a steep decline from the time of Napoleon to 1849 rose sharply after that year, until another decline began in 1873. They have pointed to the rise in gold production from 1849 to 1853 as the cause of that rise, although they have never satisfactorily explained why the price rise came to an end while gold continued to be produced at an annual rate five times as high as the highest ever known before 1845. Warren and Pearson have sought the explanation in the ratio of the world's stock of gold to the annual production of basic commodities. I have shown elsewhere² that their explanation is flatly contradicted by their own figures, both for the United States and for England, and shall not here go into that matter again. But since they, as well as Cassel, Kitchin, Fisher, and most of the well-known writers on the subject,³ have

¹ As is stated in the Preface, this appendix was written by Rufus S. Tucker.

² *Journal of Political Economy*, 1934, Vol. XLII, pp. 517-30.

³ J. M. Keynes has expressed doubts on this point. Compare *Treatise on Money*, Vol. I, pp. 57, 58, 67-69, 75.

accepted as their prime postulate a rising trend in commodity prices from 1849 to 1873, because the Jevons, Sauerbeck, and *Economist* indexes show such a trend, it is necessary to examine those indexes closely to find flaws, if they exist.⁴

They do exist, and they are so serious as to make the three indexes wholly misleading as measures of the general price level or the purchasing power of gold, although they are moderately valuable as measures of speculative business activity for use in connection with studies of business cycles. Probably that is all any index of raw material prices is good for, no matter how constructed, but those indexes contain defects that can only be excused on the ground that the science of economics was not so far advanced when they were constructed as it is now.

1. The Sauerbeck and *Economist* indexes are arithmetic averages of price relatives. As all modern textbooks on statistics point out, arithmetic averages have a tendency to exaggerate both fluctuations and trends and to over-emphasize exceptional items. The Jevons index is a geometric or logarithmic average, and for that reason shows much less of a rise after 1849 than the others.

2. All three indexes are composed entirely of raw materials and foodstuffs. Raw materials, it is generally known, fluctuate much more widely and rapidly than finished goods. It is not so generally known, but is equally true, that they do not always show the same trend as finished goods even when fluctuations are smoothed out, for the prices of finished goods embody more labor costs, more interest, and more rent. The price of labor has usually had a rising, or at least a horizontal trend when raw material prices were falling; and interest

⁴ We need to consider only British prices, for no other country was on the gold standard during the whole of the period under discussion. In 1861, just before the United States left the gold standard, commodity prices were nearly as low as in 1849.

rates, although frequently corresponding in direction with raw material prices, have changed their direction at different times and have moved sometimes farther and sometimes not so far.

3. All three indexes are very crudely weighted, if they can be said to be weighted at all. Jevons makes straw as important as wheat; he and Sauerbeck both make indigo as important as butter; and Jevons and the *Economist* both omit coal entirely while including such unimportant items as clover or seal oil.

4. Over half the weight of the Sauerbeck and *Economist* indexes and nearly half of the Jevons index are given to imported articles. These indexes therefore do not represent the prices of British products, for imports and domestic products do not have similar trends—a fact which is proved by indexes of such prices separately that are available for Great Britain from 1854 to date, and similar separate indexes for a score of other countries in recent years. Imports should be included (with appropriate weights) in an index of consumers' goods; but the indexes under consideration are not indexes of consumers' goods.

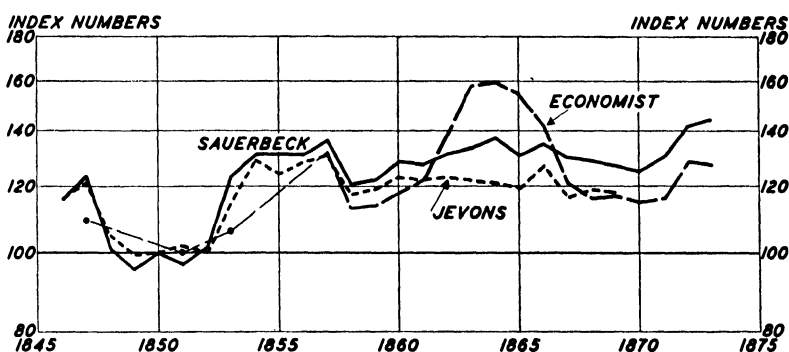
5. The prices that are stated for imports are prices in bond, before payment of duty. They are not therefore the prices paid by British buyers. Neither are they the prices received by foreign producers, for they include an unknown amount of freight charges, etc.; moreover, they are expressed in British currency while the producers in most cases were paid in money that was not stable in relation to British currency. Prices without duties are useful in connection with studies of the barter terms of international trade, but they are useless as a measure of prices within a country. To measure prices in Great Britain, it is obvious that the duties must be added. This is especially important because between 1846 and 1880 British duties were drastically reduced or abolished, and

the natural effect of such action is to make prices in bond go up while prices paid by domestic buyers go down. For example, the duty on tea was reduced from 26¼d. per pound in 1849 to 6d. per pound in 1873; the price in bond rose from 8½d. to 12d., and Sauerbeck's relative price rose from 75 to 107; but the price paid by British wholesale buyers fell from 34¾d. to 18d. Similarly, sugar and rice are stated to have risen whereas they actually fell. Even when the duty on an import was not changed, the effect of taking the price exclusive of duty is to magnify the fluctuations greatly, as in the case of tobacco, which the *Economist* index states rose 92 per cent from 1845-50 (the base period) to 1870, whereas it actually rose only about 10 per cent. Or take pepper in the Jevons index. The price in bond rose from 3.1d. per pound in 1849 to 4.3d. in 1863, or 39 per cent; but the price paid by British grocers rose only from 9.4d. to 10.6d., or 13 per cent.

6. Finally, there are some theoretical and practical questions that apply to all indexes of wholesale commodity prices. Can an index containing only 40 or 50 items theoretically represent all wholesale prices correctly? Are wholesale prices the most significant kind of commodity prices? Should commodities be weighted according to their relative importance in production or in trade or in consumption? Do commodity prices by themselves, ignoring wages, rents, and capital goods, represent the purchasing power of money? Leaving all these theoretical considerations aside, there are some practical points to consider. The commodities whose wholesale prices are preserved in records and available for treatment are nearly always raw materials which are bought and sold in comparatively well-organized markets, or else those subject to import duties, or else staple agricultural products. They cannot be accepted therefore as fair samples of all commodities. In well-organized markets, speculation frequently causes price movements more

rapid than those in unorganized markets. The prices that fluctuate the most are most likely to be recorded. Prices of goods subject to import duties are frequently understated by importers or valued arbitrarily by officials. And agricultural products are subject to alternations of glut and scarcity that are in no way caused by general economic factors and are in no way shared by other com-

INDEXES OF BRITISH WHOLESALE PRICES OF
CONSUMERS' GOODS, 1847-73^a



^a Bases: Jevons and Sauerbeck, 1850; *Economist*, Jan. 1, 1851.

modities, since they are directly caused by weather conditions or by insects. Bearing these limitations in mind, I now submit the results of recalculating the Sauerbeck average, and some other measures of prices from 1822 to 1873, to test whether the changing supply of gold had any effect on the price level in Great Britain.

The table on page 183 contains for each significant year⁵ from 1846 to 1873 the three indexes as published reduced to 100 in 1850 (except the *Economist* index for which January 1, 1851 equals 100). These indexes are also shown in the accompanying chart. The table also shows what the Sauerbeck and *Economist* indexes would

⁵ A year was considered as significant when, from inspection of any of the available price indexes, it seemed possible that it might mark a change in trend.

have been if the duties had been added to the prices of dutiable imports and if geometric means had been used instead of arithmetic means. And finally it shows what the Sauerbeck index would have been if the weights, in addition to these corrections, had been adjusted to conform more closely to those used by the Board of Trade and other makers of weighted indexes. The corrected index is shown in the chart on page 189. Similar corrections cannot be made for the Jevons index, since Jevons used several items which no one else has ever used, and did not state precisely what his weights were. The *Economist* index has not been reweighted because it contains so few items that a slight shifting of weights would greatly change the results.

The great discrepancies between the indexes make one wonder if any of them represent commodity prices or raw material prices in general, or if they can claim to be anything more than mere averages of the prices of the particular commodities they contain.

The indexes show a sharp fall in the prices of raw materials and foodstuffs from 1847 to 1849, very low prices from 1849 to 1852, and a sharp rise from 1851 or 1852 to 1854, flattening to a peak in 1857 slightly higher than the peak in 1847. Nearly half the rise was lost in 1858 or 1859. The American Civil war raised the prices of cotton and tobacco so that in 1864-66 the indexes were at about their 1857 level. The *Economist* index, which is $\frac{5}{22}$ cotton and tobacco, rose to ridiculous heights. By 1870 prices were back to pre-war levels and then came a short, sharp, speculative rise, almost entirely confined to meats, metals, and coal, that caused the Sauerbeck index to reach its highest peak in 1873.

Bear in mind that gold was discovered in California in 1848 and that the world's gold production rose rapidly until 1853 and continued at a high level thereafter. If gold controls prices, it seems strange that prices did not rise at all for three years and practically flattened out in

WHOLESALE PRICES OF RAW MATERIALS AND FOODSTUFFS IN GREAT BRITAIN,
1846-73

Year	Sauerbeck Index (1850=100)			<i>Economist</i> Index (Jan. 1, 1851=100)		Jevons Index (1850 =100)
	Original	Corrected ^a (Un- weighted)	Corrected ^b (Weight- ed)	Original	Corrected ^a	Original
1846.....	115.6	...	...	...	...	115.7
1847.....	123.4	119.9	125.2	(109.6)	(109.9)	120.8
1848.....	101.3	...	...	...	...	105.0
1849.....	96.1	97.8	99.2	...	...	99.0
1850.....	100.0	100.0	100.0	...	...	100.0
1851.....	97.4	98.0	97.4	100.0	100.0	102.0
1852.....	101.3	102.3	102.4	...	...	100.0
1853.....	123.2	...	...	106.6	...	114.9
1854.....	131.2	...	...	...	...	128.6
1855.....	131.2	126.2	126.4	...	...	123.8
1856.....	131.2	...	...	...	...	127.7
1857.....	136.8	133.5	127.9	132.1	127.7	130.7
1858.....	120.8	118.8	117.8	113.1	...	116.8
1859.....	122.1	121.1	119.2	114.0	...	118.8
1860.....	128.6	...	...	118.3	...	122.8
1861.....	127.3	...	...	121.8	...	121.8
1862.....	131.2	...	...	137.9	...	122.8
1863.....	133.8	...	...	157.6	...	121.8
1864.....	137.6	128.2	130.6	159.3	...	120.8
1865.....	131.2	...	...	154.6	...	119.8
1866.....	134.9	...	...	142.6	...	126.7
1867.....	129.7	...	...	121.3	...	116.8
1868.....	128.6	125.5	118.8	116.5	...	118.8
1869.....	127.3	...	...	117.0	...	117.8
1870.....	124.7	121.4	121.6	115.3	...	...
1871.....	129.7	...	...	116.4	...	...
1872.....	141.6	...	...	127.5	...	...
1873.....	144.2	137.3	142.1	126.3	120.6	...

^a Corrected by adding duties to the prices of dutiable imports and by taking geometric instead of arithmetic means.

^b Corrections indicated in note *a* plus adjustment of weighting to conform more closely to weights used by the Board of Trade and other makers of weighted indexes. Compare pp. 181-82.

1854 until the short-lived boom in 1872 and 1873. One cannot help thinking that the Crimean war in 1854-55 and the American Civil war in 1861-65 correlate better

chronologically with price rises than do the changes in the gold supply.

But if prices of raw materials failed to react to gold

PRICES OF CONSUMERS' GOODS IN GREAT BRITAIN, 1847-73
(1850=100)

Year	Wood Index of Cost of Living ^a	Tucker Indexes of Consumers' Goods ^b	
		Changing Items	Items Unchanged
1847.....	(131)	122.0	130.2
1848.....	(113)	111.3	...
1849.....	(106)	105.5	...
1850.....	100	100.0	100.0
1851.....	97	99.5	...
1852.....	97	97.5	...
1853.....	106	109.9	...
1854.....	122	117.7	...
1855.....	126	117.8	...
1856.....	126	118.3	...
1857.....	119	118.3	123.7
1858.....	109	107.7	...
1859.....	107	111.9	...
1860.....	111	115.4	...
1861.....	114	118.2	...
1862.....	111	119.4	...
1863.....	107	119.1	...
1864.....	106	120.1	...
1865.....	107	118.5	...
1866.....	114	123.4	...
1867.....	121	123.9	...
1868.....	119	122.4	...
1869.....	113	115.2	...
1870.....	113	113.3	...
1871.....	113	116.1	...
1872.....	120	121.2	...
1873.....	122	121.0	129.0

^a An index of unweighted arithmetic average prices of an unstated number of retail commodity prices, beginning with 1850. It has been carried back to 1849 by using 24 price series that were apparently among those used by Wood in 1850, and to 1847 by using 11 price series.

^b For items and weights of these indexes, see pp. 196 and 198.

production, what about prices of finished goods—consumers' goods? In the accompanying table we present for comparison two indexes of commodities at retail which cover this period. The first is Wood's index, which is an

unweighted arithmetic average of an unstated number of retail commodity prices.⁶ Wood's index begins with 1850; I have carried it back to 1847 by using, for 1847 and 1848, 11 price series that were apparently among those Wood used for 1850, and 24 series for 1849. The series shown in the second column of the table is an index of consumers' goods which I have compiled. It includes between 60 and 75 price series, representing between 41 and 47 distinct commodities. It is a geometric mean, weighted in accordance with the estimated expenditures of a skilled workingman's family in London. The weights are based on studies by the Board of Trade for more recent years, and studies by Wood, Chadwick, Neild, and Lowe for earlier years.⁷ The quotations are all from the Board of Trade, the *Economist*, Sauerbeck, Jevons, or various official reports to Parliament. They are mainly wholesale or contract prices of finished goods or foods, but include a few retail prices.

Since the quotations available varied from time to time, it was necessary to construct separate indexes, each covering a number of consecutive years, and to link them together. As a check, another index consisting of 53 items (28 commodities) that were available both in 1847 and 1873 was prepared for scattered years. It is given in the last column.

For the years from before 1850 Silberling prepared an index of the cost of living which is based on the wholesale price of raw materials, weighted in accordance with the importance of the products of those materials to consumers of finished goods, duties being included in the prices of imports. This index shows a more rapid fall of prices from 1847 to 1850 than do the indexes shown in

⁶ *Journal of the Royal Statistical Society*, 1909, Vol. LXII, Part I, p.

102.

⁷ G. H. Wood, *Co-operative Wholesale Society Annual*, 1901; D. Chadwick, *Journal of the Royal Statistical Society*, March 1860; W. Neild, *Journal of the Royal Statistical Society*, January 1842; J. Lowe, *Present State of England*, 1822.

the table, presumably because of the greater variability of wholesale as compared with retail prices. With 1850 as the base the annual averages are as follows:

1847	139.8
1848	116.9
1849	103.6
1850	100.0

Another study of living costs was published by Chadwick in the *Statistical Journal* for March 1860. It is a weighted budget representing the cost of living of workingmen's families in Manchester in 1849 and 1859. Omitting rents, which were the same in the two years, Chadwick's budget showed a cost of living of 257½d. per week in 1849 and 246½d. in 1859. Using Chadwick's method, Wood arrived at 272½d. as the budget for 1872-73.

It is clear beyond a possibility of doubt that the rise in prices of finished commodities from the level of 1849-52 to that of 1855-57 was merely a cyclical fluctuation, for the ensuing depression brought them down practically to 1849 levels in 1858 or 1859. The peak of 1855-57 and the peak of 1873 were lower than the peak of 1847, the year before gold was discovered. Not only was the peak of 1857 lower than that of 1847, but the average for 1849-58 was lower than the average for 1839-48.⁸

There was no rising trend in the prices of consumers' goods in Great Britain in the middle of the nineteenth century. During the years 1849-52, when gold production was increasing most rapidly and when the annual increase in the world's gold stock was proportionately greatest, prices of consumers' commodities fell, while those of raw materials did not rise. The periods of rising

⁸ The Jevons index as originally published averaged 77.5 in the decade before the gold discoveries, 73.9 in the following decade. The respective figures for the original Sauerbeck index were 91.3 and 89.9.

prices were periods of crop failures,⁹ of war scarcity,¹⁰ of speculative booms based on bank credit expansion,¹¹ or of some combination of these factors.

In the table on page 188 we have brought together a number of series of data relative to the gold holdings of Great Britain. These data yield no evidence that the quantity of gold purchased, or imported into England, or held by the Bank of England, had any effect in causing commodity prices to rise when they did, although the scarcity of gold was frequently alleged to be one of the reasons why each boom in commodity prices ended in a collapse,¹² and why the Bank of England had to issue notes without a gold backing in 1847, 1857, and 1866. But prices did not rise perceptibly until the output of gold passed its peak and began to decline.

I have stated that the upswings of prices in the fifties and sixties were merely cyclical and not caused by increasing gold supplies. For confirmation of this statement let us consider the movements of prices between 1822 (the first full year that England was on the gold standard) and 1849. Obviously, if the movement of prices from 1822 to 1849 and their movement from 1849 to 1873 were alike in trend, the gold discoveries can be flatly said to have had no visible effect on commodity prices.

The Jevons and Sauerbeck indexes, as well as the more recent Silberling index of wholesale prices in England before 1850, are so heavily weighted with imported goods that they would not represent the general commodity price level in England even if the import duties

⁹ 1845-47, 1872-73. For this and the two following footnotes, compare Thorp's *Business Annals*, pp. 161-67.

¹⁰ 1854-55, 1860-65.

¹¹ 1843-47, 1856-57, 1863-66, 1871-73. See the table on p. 188 for the reserve ratio of the Bank of England for those years.

¹² For an excellent discussion of this point, see J. T. Phinney, "Gold Production and the Price Level: The Cassel Three Per Cent Estimate," *Quarterly Journal of Economics*, 1933, Vol. 47, pp. 647-79.

THE GOLD POSITION OF GREAT BRITAIN, 1840-73
(In thousands of pounds sterling, with exception of world
production and ratio figures)

Year	World Production of Gold ^a (In mil- lions of fine ounces)	Imports of Gold into Great Britain ^b	Net Imports of Gold ^c	Gold Minted ^d	Gold Bullion and For- eign Coin Bought by Bank of England ^e	Coin and Bullion in Bank of England ^f	Percentage Ratio of Coin and Bullion in Bank to Deposits, Bills, and Notes ^g
1840..	0.94	...	...	...	280	4,190	...
1841..	0.94	...	...	...	1,280	4,725	...
1842..	0.94	...	...	...	2,830	8,278	...
1843..	0.94	...	...	...	4,520	11,850	...
1844..	0.94	...	...	...	3,760	14,664	42
1845..	1.18	...	...	...	3,780	15,243	41
1846..	1.34	...	...	4,334	4,530	14,785	36
1847..	1.41	...	...	5,158	4,860	10,428	30
1848..	1.81	...	...	2,451	5,790	13,872	41
1849..	3.15	...	...	2,177	3,640	15,161	42
1850..	3.56	...	...	1,491	2,940	16,636	43
1851..	4.05	9,300	...	4,400	7,100	14,564	39
1852..	6.71	16,130	...	8,742	15,350	20,587	49
1853..	7.23	21,600	...	11,952	8,730	17,516	41
1854..	6.31	21,500	...	4,152	6,610	13,997	38
1855..	6.64	19,180	...	9,008	8,310	14,181	38
1856..	6.83	21,060	...	6,002	7,070	10,932	30
1857..	6.66	13,220	...	4,859	...	10,116	27
1858..	6.31	22,793	10,226	1,231	...	17,847	43
1859..	6.07	22,298	4,216	2,649	...	17,928	41
1860..	5.93	12,585	3,056	3,121	...	15,239	36
1861..	5.88	12,164	925	8,190	...	13,009	34
1862..	5.82	19,904	3,891	7,836	...	16,360	38
1863..	5.93	19,143	3,839	6,607	...	14,567	34
1864..	5.86	16,901	3,621	9,535	...	13,482	33
1865..	6.38	14,486	5,992	2,367	...	14,546	34
1866..	6.45	23,510	10,767	5,076	...	14,887	33
1867..	6.26	15,800	7,911	496	...	21,353	43
1868..	6.24	17,136	4,427	1,653	...	20,838	42
1869..	6.22	13,771	5,297	7,372	...	18,825	40
1870..	6.05	18,807	8,973	2,313	...	20,776	42
1871..	6.24	21,619	920	9,919	...	23,588	44
1872..	5.65	18,469	1,279	15,261	...	22,585	41
1873..	5.30	20,611	1,539	3,384	...	22,665	41

^a Based on estimates by Soetbeer and Del Mar.

^b Before 1858, when the official figures begin, these are estimates from the *Economist*, Oct. 23, 1852, p. 1179; Jan. 24, 1857 (supplement), p. 24; July 11, 1857, p. 756. The figure for 1857 is for the first six months only. These estimates refer only to newly mined gold.

^c Tooke and Newmarch, *A History of Prices*, Vol. VI, Appendix XXII, p. 699, for 1841-56. Later figures from reports of Deputy Master of the Mint.

^d Compiled from reports of the Board of Trade.

^e Tooke and Newmarch, *A History of Prices*, Vol. VI, Appendix XXVI.

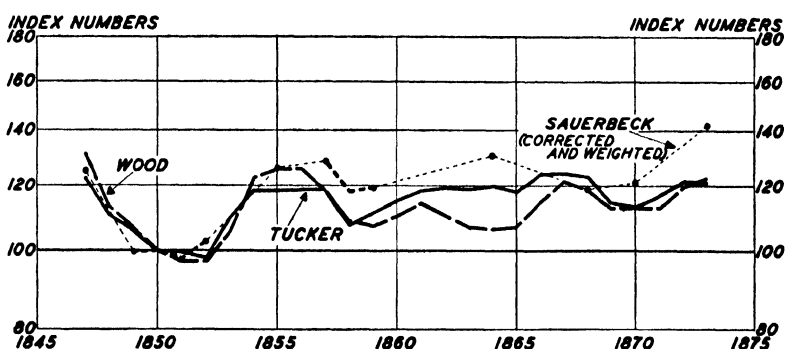
^f R. H. I. Palgrave, *Bank Rate and Money Market*.

could be added to the price quotations.¹⁸ That cannot be done because the individual price series have not been

¹⁸ Of Jevon's 40 series, 18 are imports; of Silberling's 35, 24 are imports. Sauerbeck has only 31 items and they are not stated, but at least 12 must be imports, and possibly as many as 24.

published, but it is possible to make a separate index from the Jevons groups which contained only domestic items (22 commodities). This has been done for all significant years and is shown in the table on page 191. Wood has published an index of the cost of food and fuel for scattered years and that is also shown, converted to 1850 as the base year. The last column in this table presents my composite index of prices of consumers'

THE SAUERBECK INDEX OF WHOLESALE PRICES, CORRECTED
AND WEIGHTED, COMPARED WITH TWO
CONSUMER GOODS' INDEXES

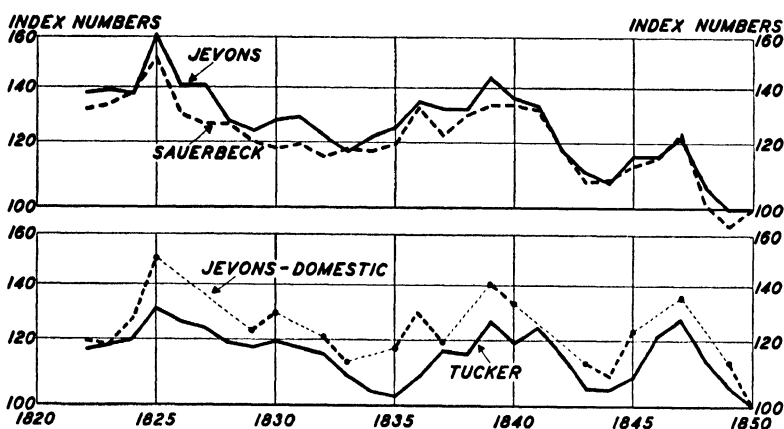


goods, described above, for the years before 1850. In the chart on page 190 we have our comparison from 1822 to 1850 the Jevons and Sauerbeck indexes, the Jevons index for domestic goods only, and my consumers' goods index. The latter two are very similar in trend, although the Jevons index, being composed of raw materials, naturally fluctuates more. Both indicate a much less rapid fall from 1822 to 1850 than that indicated by the other indexes, and a glance at the table on page 184 will show that they are corroborated by the Wood index.

Comparing the charts on pages 189 and 190, which are on the same scale, we see that the down-trend of the prices of finished commodities continued from 1825 to 1873. We see also that prices lower than those of 1849

occurred in 1834-35, 1843-44, and 1850-52. The price depression of 1849-52 was the deepest in the whole nineteenth century, but it was not the final result of a long downward price trend; on the contrary it followed immediately after a boom that had carried prices up 18 per cent in three years, to a point they had not attained since 1825.¹⁴ Similarly, the peak of 1872-73 was not the

PRICE CHANGES AS INDICATED BY JEVONS AND SAUERBECK INDEXES, COMPARED WITH THOSE OF DOMESTIC GOODS IN JEVONS INDEX, AND WITH TUCKER INDEX OF CONSUMER GOODS' PRICES IN LONDON^a



^a For data, see the tables on pp. 183 and 191.

culmination of an upward trend but was actually lower than the peaks of 1839, 1841, and 1847. It was also lower than the peak of 1867, which may or may not have been lower than 1847 but was certainly lower than 1839.

We have shown that the upward movement of prices of raw materials from 1849 to 1857 was much less extensive than that shown by the crude Sauerbeck index, and the upward movement of prices of finished goods was still less. It was merely a cyclical boom, like that

¹⁴ Bread was dearer in London in 1847 than in any other year between 1818 and 1917, which were both years when England was not on the gold standard.

INDEXES OF COMMODITY PRICE LEVEL IN GREAT BRITAIN, 1822-50
(1850=100)

Year	Jevons Index of Domestic Products ^a	Wood Index of Food and Fuel ^b	Tucker Index of Consumer Goods in London ^c
1822.....	119.7	...	116.1
1823.....	118.5	...	118.3
1824.....	126.3	113.6	120.2
1825.....	150.2	...	131.6
1826.....	...	...	126.1
1827.....	...	...	123.5
1828.....	...	...	119.3
1829.....	122.4	...	117.0
1830.....	129.4	...	119.7
1831.....	...	...	117.4
1832.....	120.3	...	115.3
1833.....	112.6	...	109.1
1834.....	...	...	104.4
1835.....	116.8	...	102.7
1836.....	129.7	...	108.8
1837.....	119.5	...	116.2
1838.....	...	...	115.5
1839.....	140.2	...	126.3
1840.....	132.7	110.9	119.5
1841.....	...	...	124.0
1842.....	...	...	115.2
1843.....	112.8	...	105.7
1844.....	109.2	...	105.0
1845.....	123.7	...	109.3
1846.....	...	...	121.5
1847.....	135.6	...	127.4
1848.....	...	...	114.0
1849.....	112.6	...	106.1
1850.....	100.0	100.0	100.0

^a Average of those of Jevons' group averages that contained only domestic products.

^b *Co-operative Wholesale Society Annual*, 1901, p. 265.

^c See pp. 188-89 for description.

which occurred before 1825 and 1839 and 1847, and very little, if at all, greater in extent. In fact the rise shown by the consumers' goods index was only 21.4 per cent in the fifties and 23.0 per cent in the thirties. It was probably, like all other modern booms, based on expanding bank credit, but that bank credit was not based on a

growing gold reserve in the Bank of England and was not created in the years of greatest gold production or greatest gold imports. The boom was carried further by the Crimean war, which cut off the supply of Russian goods (wheat, tallow, timber, flax, linseed oil, hemp) and increased the demand for metals, coal, leather, food, cloth and other war munitions. But even with this aid the prices of consumers' goods averaged lower in 1857 than in 1847, and the average for 1849-58 was lower than the average for 1839-48.

This was the opinion of the two most thorough students of that time, Tooke and Newmarch, who stated:

... as far as can be ascertained by a careful examination of the course of prices in this country as regards a considerable number of leading commodities, it does not appear that the prices prevailing in the early part of 1857, when compared with the prices prevailing in 1851, justify the inference that, in any manifest and appreciable degree, the increase in the quantity of metallic money, by means of the new gold, has raised the prices of commodities;—in other words, in every instance of a variation of price, a full explanation of the change is apparently afforded by circumstances affecting the supply or the demand.¹⁵

The price rise from 1858 to 1864 was plainly caused by the American Civil war and was almost entirely limited to cotton and tobacco. It is not necessary to explain here the price movements between 1865 and 1873, although it is obvious that they were based on a post-war speculative boom and collapse. Surely if the great increase in the world's stock of gold between 1849 and 1853 had any effect at all it would have been manifest before 1865.

Summing up, it has been shown that there was no upward trend in the price of consumers' goods in England after gold was discovered in California and Australia,

¹⁵ Tooke and Newmarch, *History of Prices*, Vol. VI, Pt. VII, Sec. 15, par. 7. Compare also Newmarch in *Journal of the Royal Statistical Society*, March 1859, Vol. XII, p. 97.

but only at most a further slowing-up of the slow down-trend that had been going on since 1825 and a damping of the cyclical swings. The apparently upward trend in prices of raw materials was much less extensive than has been generally believed. It was not a steady trend; it was a series of cyclical movements which did not coincide with increases in gold supply, but with wars and periods of credit inflation. The cessation of this spurious trend in 1873 could not have been caused by a declining output of gold, for the annual additions to the world's stock continued after 1873 at a much higher rate than before 1849, whether measured in ounces, in proportion to existing gold stock, or in relation to the production of other basic commodities. If the price level is largely determined by the gold supply, and if it declined only slowly on the pre-California output of gold, it certainly had no cause to decline rapidly on an output five times as large in absolute amount, and 1.5 times as large relatively to the existing stock. Consequently, the conclusion is warranted that the general level of commodity prices in England did not rise in the middle of the nineteenth century, and that such rises as occurred in the prices of raw materials cannot be attributed to the gold discoveries. Since England was then on the gold standard, and the increases in the gold stock of the world were on a scale never reached before or since, it is obvious that the theory that changes in the gold supply determine commodity price trends is not supported by the record of what actually occurred at the time when this theory had its best opportunity in modern times to justify itself, and when it has generally been supposed that it did justify itself.

NOTES ON STATISTICAL TECHNIQUE USED IN APPENDIX A

CORRECTION OF SAUERBECK AND *Economist* INDEXES

The *Economist* index was corrected only by adding import duties to the prices of imports that in the original were quoted in bond, and by using geometric instead of arithmetic averages. No changes were made in the weights. Both the original and the corrected indexes are here shown with January 1, 1851 as the base instead of the average of 1845-50. The figures calculated for 1847 are averages of 20 items out of the 22 used in the published *Economist* index. The prices of these items were obtained from the same source (the *Economist* magazine for that year). It was impossible to find the prices for cotton cloth and cotton yarn that were used in the original index.

The corrected unweighted Sauerbeck index is also a geometric average with the same weights as the original index but with duties added to the prices of imports.

The corrected weighted Sauerbeck index was re-weighted as shown in the table on page 195, which also shows Sauerbeck's original weights for the period 1846-66, the weights used in the original Board of Trade index for the year 1871, and the weights used by Warren and Pearson for the United States in 1850. It is plain that the changes in weights are supported by high authority and are by no means arbitrary.

CONSTRUCTION OF CONSUMERS' GOODS INDEX WITH CHANGING ITEMS

This is really a series of separate index numbers linked together. Each link is calculated as a weighted geometric mean, including all the available price series representing consumers' goods, weighted in accordance with their importance in the budget of skilled workingmen's families in London (excluding rents). The most important link for the present study is that extending from 1847 to 1862, which is composed of the 43 items listed in the table on page 196.

The items marked Sauerbeck, Jevons, and *Economist* are taken from their published index numbers, with tariffs added

WEIGHTS USED IN INDEXES OF COMMODITY PRICES

Commodity	Sauerbeck ^a		Board of Trade	Warren and Pearson
	Original	Corrected		
Wheat.....	4.7	7.0	9.3	4.7
Flour.....	2.3	2.3	...	4.1
Barley.....	2.3	2.3	4.4	0.3
Oats.....	2.3	2.3	3.2	0.6
Potatoes....	2.3	4.7	6.5	2.3
Beef.....	4.7	7.0	10.3	8.3 ^c
Mutton.....	4.7	4.7	6.4	1.1 ^d
Pork.....	2.3	2.3	...	7.5 ^e
Bacon.....	2.3	2.3	4.2	1.3 ^f
Iron.....	4.7	4.7	3.2	2.6
Copper.....	2.3	2.3	1.0	1.1
Lead.....	2.3	0.6	0.3	0.3
Coal.....	4.7	6.0	6.7	6.2
Wool.....	4.7	4.7	3.8	1.5
Leather.....	2.3	2.3	...	3.1
Maize.....	2.3	2.3	1.6	3.1 ^g
Rice.....	2.3	2.3	0.2	0.8
Butter.....	2.3	4.7	8.9 ^b	4.4
Sugar.....	4.7	4.7	4.0	2.1
Coffee.....	2.3	2.3	0.2	1.6
Tea.....	2.3	2.3	1.6	0.1
Tin.....	2.3	0.6	0.3	...
Cotton.....	4.7	7.0	7.5	4.1
Flax.....	2.3	0.6	0.8	0.3
Hemp.....	2.3	1.7	...	0.3
Jute.....	2.3	2.3	0.6	...
Silk.....	2.3	2.3	1.8	...
Hides.....	2.3	2.3	1.6	1.3
Tallow.....	2.3	0.6	...	...
Palm oil.....	2.3	0.6	0.1	...
Olive oil.....	2.3	0.6	0.2	0.03
Linseed.....	2.3	1.2	1.0	0.2
Nitrate.....	2.3	2.3	...	...
Indigo.....	2.3	0.6	...	0.2
Timber.....	2.3	3.3	4.0	5.0
Total.....	99.7	100.1	93.7	68.53

^a The indexes are given in the table on p. 183.^b Milk.^c Including cows and steers.^d Including sheep.^e Including ham and hogs.^f Lard.^g Including corn meal.

WEIGHTS OF COMMODITIES IN THE TUCKER INDEX OF CONSUMERS' GOODS WITH CHANGING ITEMS, 1847-62
(As percentages of aggregate of weights)

Commodity	Weight	Source	Commodity	Weight	Source
FOOD.....	60		Tea.....	{ 1 1	Sauerbeck (Congou) Jevons Board of Trade (2 ser.)
Flesh.....	1	Greenwich	Rice.....	{ 2 1	Sauerbeck ^a Sauerbeck (2 ser.)
Beef.....	{ 2 2	Sauerbeck Jevons	Sugar.....	{ 1 1	Jevons St. Thomas ^d
Mutton.....	{ 1 1	Sauerbeck Jevons	Pepper.....	1	Jevons
Pork.....	{ 1 1	Sauerbeck Jevons	Rum.....	1	Jevons
Lard.....	{ 1 1	Board of Trade Sauerbeck	Coffee.....	1	Sauerbeck (2 ser.)
Bacon.....	{ 1 1	Board of Trade Sauerbeck	Tobacco.....	1	<i>Economist</i>
Bread.....	5	Greenwich	FUEL AND LIGHT.....	9	
Flour.....	2	Board of Trade	Coal.....	{ 2 2	Greenwich Sauerbeck (2 ser.)
Flour.....	3	Bethlem	Candles.....	2	Bethlem
Milk.....	2	Sauerbeck	Tallow.....	2	Greenwich Sauerbeck (2 ser.)
Butter.....	1	Bethlem ^a	CLOTHING AND SUNDRIES.....	31	
Butter.....	2	Bethlem ^a	Shoes.....	3	Greenwich
Cheese.....	{ 1 2 ^b	Greenwich Bethlem	Stockings.....	3	Greenwich
Cheese.....	1	Board of Trade	Hats.....	1	Greenwich
Peas.....	1	Greenwich	Suits.....	5	Greenwich
Peas.....	{ 1 1	Jevons Jevons	Coats.....	4	Greenwich
Beans.....	1	Greenwich	Cotton cloth.....	2 ^a	<i>Economist</i>
Oatmeal.....	2	Greenwich	Cotton piece goods, plain	2 ^c	Board of Trade
Potatoes.....	4	Sauerbeck ^a	Cotton piece goods, dyed	2 ^b	Board of Trade
Salt.....	1	Greenwich	Cotton thread.....	1	Board of Trade
Herrings.....	1	Board of Trade	Woolen yarn.....	1	Greenwich
Malt.....	1	Greenwich	Mops.....	1	Board of Trade
Hops.....	1	Greenwich	Soap.....	1	Board of Trade
Beer.....	1	Greenwich	Manufactured exports (14 items).....	7	Soetbeer

^a Average of Bethlem and St. Thomas after 1855. ^b One after 1855. ^c Average of Sauerbeck and St. Thomas after 1855.

^d After 1855 only. ^e After 1850. ^f Three before 1851.

to price of all dutiable imports. The Greenwich items are taken from "Prices" in McCulloch's *Dictionary of Political Economy*. The Soetbeer prices are taken from his "Materialen" (Tausig's translation) pages 252-55. The Board of Trade's prices are taken from its *Report on Wholesale and Retail Prices*, 1902, as are also the St. Thomas and most of the Bethlem prices; the others are from *Sessional Papers*, 1850 (213), Vol. 35, and 1854 (257), Vol. 52. Nearly all of the prices are at wholesale, or contract prices for hospitals, but they are all goods ready for consumption without further processing except what is customarily done in the consumer's household.

Since a greater number of commodities are included than in Sauerbeck's index, and since the commodities are weighted according to their importance in consumption, this index is *prima facie* a better measure of the purchasing power of John Bull's money. Over 90 per cent of the commodity purchases of the mass of the people are here represented. Although some raw materials generally considered important are not included by name they are all represented by their finished products, in the proper proportion to indicate the purchasing power of money or of gold.

The links from 1862 to 1868 and from 1868 to 1873 were essentially like the preceding. The weights were: food, 60; fuel and light, 9; clothing, 20; sundries, 11. The weights of single items varied according to the number for which prices were available. The most important were: meats, 12 to 17; bread and flour, 13 or 14; dairy products, 8 or 9; coal, 5 or 6; cotton cloth, 6 to 9; suits of clothing (until 1868), 5; coats (until 1868), 4.

The index for the years before 1850 was constructed in the same manner, the links being 1819-31, 1828-35, 1834-37, and 1836-50. Strangely enough it has been possible to include more items in some of the years before 1850 than in later years. The numbers vary from 34 items representing 28 distinct commodities to 97 items representing 46 distinct commodities. For these years the weight of food has been increased to 67 per cent, and clothing, fuel, and sundries correspondingly reduced. A more detailed description of the links before 1850 will ap-

WEIGHTS OF COMMODITIES IN VARIOUS CONSUMERS' GOODS INDEXES^a

Commodity	Tucker Index with Items Unchanged		Chadwick		Board of Trade ^b		Silberling
	Number of Price Series	Weight Used	1849	1859	Minimum	Maximum	
Beef.....	4	8	...	...	7.4	12.0	10.7
Mutton.....	4	5	10.8	10.4	5.0	7.4	10.7
Pork.....	2	3			3.1	3.7	...
Bacon.....	1	4	5.6	5.1	4.0	7.4	...
Bread.....	3	15	14.9	15.1	10.4	12.7	26.8
Flour.....	2	6	3.4	3.5	4.2	12.1	8.9
Butter.....	4	6	3.7	4.2	5.6	9.7	...
Cheese.....	1	2	...	...	0.0	2.1	...
Milk.....	1	6	6.5	6.7	0.0	5.2	...
Potatoes.....	1	7	7.5	7.7	3.8	9.6	...
Rice.....	1	2	1.9	1.9	0.0	0.6	...
Fish.....	1	1	...	...	0.0	0.0	...
Tea.....	3	4½	4.0	3.8	4.6	5.6	3.6
Coffee.....	3	1½	2.5	2.6	0.0	0.4	1.8
Sugar.....	4	4	4.6	4.8	4.0	5.6	5.0
Salt.....	1	1	...	...	...	...	...
Oats.....	1	2	2.8	3.8°	1.0	1.5°	5.0
Beer.....	1	1	...	...	...	...	...
Spirits.....	1	½	...	...	...	...	...
Tobacco.....	1	1	...	...	0.0	1.0	...
Olive oil.....	1	½	...	...	...	...	...
Cotton piece goods.....	2	6					
Cotton thread..	1	1	11.1 ^d	11.5 ^d	15.0 ^d	15.0 ^d	5.4°
Woolen yarn...	1	4	...	...	...	...	5.4°
Tallow.....	2	2	1.9	1.9 ^f	0.3	0.8 ^f	...
Coal.....	3	4	3.7	3.8	6.0	7.7	...
Soap.....	1	2	2.3	1.9	0.0	1.0	...
Total.....		100	87.2	87.7			83.3

^a The indexes are given on p. 186 and in the tables on pp. 183 and 184.^b Minimum and maximum weights in the various indexes.° Oatmeal. ^d Clothing. ° Cotton. ^f Candles. ° Wool.

pear shortly in connection with a study of prices from 1729 to 1900.¹⁶

¹⁶ *Journal of the American Statistical Association*, March 1936.

CONSTRUCTION OF CONSUMERS' GOODS INDEX
WITH UNCHANGED ITEMS

This index was calculated for the years 1847, 1850, 1857, and 1873 in order to test whether the other consumers' goods index (with changing items) was biased. It includes 53 price series relating to 28 distinct commodities. These were all the consumers' goods price series I could find that were comparable in 1847 and 1873. The items and their weights are shown in the accompanying table. The table also shows the weights used in Chadwick's budgets for 1849 and 1859; those used by the Board of Trade in its various indexes of the cost of living between 1880 and 1900; and those used by Silberling in his British cost of living index before 1850.

APPENDIX B

SOME CRITICISMS OF THE LITERATURE

LOVEDAY: RELATIVE MONETARY EFFICIENCY OF DEPOSITS AND NOTES

In explaining the fact that less gold is required to maintain a check than a deposit system (compare page 37 above) Loveday gives one reason which the writer holds to be erroneous, namely, that the velocity of circulation of checkable deposits tends to be greater than that of notes, because checks cannot circulate freely from hand to hand, or be indefinitely hoarded. He says:

. . . If *A* receives a note in payment and keeps that note for three months in his pocket, it is immobilised for that period of time. But if he receives a cheque and adds the proceeds of that cheque to his account, the sum is not necessarily immobilised even though *A* himself does not draw on his account for three months. It can be mobilised by the bank in which his deposit lies. This fact alone will not of itself augment the velocity of the turnover of deposits, for the bank can only mobilise *A*'s deposit by making an advance to *B*. The total volume of deposits is *pro tanto* augmented. But *B* will tend to employ his deposit as rapidly as possible since he has to pay interest on the equivalent advance. There is thus always a force tending to counteract the inactivity of the *A*'s in any community, a force which cannot be exercised in the case of notes.¹

In the first place, the velocity of circulation of checkable deposits does not depend on the extent to which checks circulate freely from hand to hand, or are hoarded. The equivalent of the velocity of circulation of notes is not the hand-to-hand turnover of checks, but the volume of checks drawn in a given period in comparison with the average size of the deposits. The coun-

¹ *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, 1930, p. 105.

terpart of note hoarding under the check and deposit system is the conversion of active into inactive balances. One's purchasing power is immobilized just as much if he leaves a bank balance untouched for three months as it is if he carries a bank note in his pocket for three months.

It is true, as Loveday says, that when one deposits in his bank a check drawn on another bank, the lending power of his bank is augmented, but he forgets that the lending power of the bank on which the check is drawn is reduced by the same amount. Under the proportional reserve system the amount of lending which a bank can do is not affected by the extent to which its deposits are used as instruments of saving on the one hand or active media of exchange on the other hand. Only if *A*, in Loveday's hypothetical case, should transfer the funds from a demand deposit account to a time deposit account would the power of the bank to lend be augmented as a result of *A*'s decision to save funds which came to him through the medium of checks on deposit accounts already existing. This refers to American practice; under the British system lending power would not be augmented at all. Where, as in some continental banks, the amount of the reserve is left entirely to the discretion of the banker, there may be some increase in the extent to which the banker feels free to tie up his funds in relatively illiquid assets if he knows that his depositing customers expect to hold their deposits idle for long periods of time, but even in this case Loveday's generalization overstates the case.

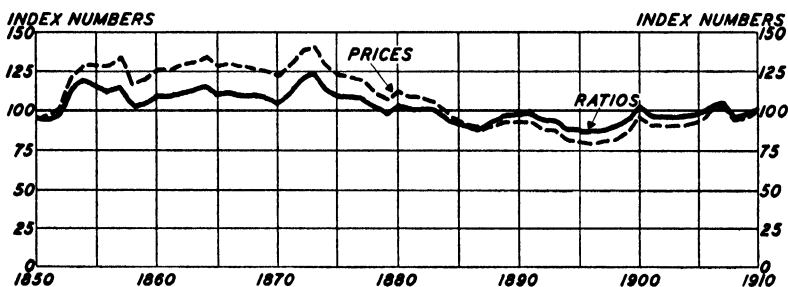
It is probably true that borrowers do tend to spend the proceeds of their borrowings more quickly than do other depositors; but what about those to whom the borrowers pay them? Proceeds of bank borrowings are indistinguishable from other funds when they have been turned over once. Moreover, the point that *B*, a borrower, will tend to employ his deposit as rapidly as pos-

sible since he has to pay interest on the equivalent advance, is equally valid if *B* takes his borrowings in the form of notes. Indeed, those who control resources of any sort suffer a loss of possible income by failure to utilize them; but we know that in spite of this loss individuals do at certain times hold their resources in the form of idle cash and bank deposits.

WOYTINSKY'S ANALYSIS OF TREND RATIOS OF GOLD PRODUCTION AND WHOLESALE PRICES

Dr. W. Woytinsky has utilized the technique of mathematical statistics in the preparation of an extended critique of the work of both Cassel and Kitchin.² He points out that although Cassel offers the fluctuations in the relative gold supply as an explanation of the trend of prices, the trend of the Sauerbeck price index is not eliminated by dividing through by the items in his curve of the relative gold supply. The accompanying diagram

RATIOS OF SAUERBECK'S PRICES TO CASSEL'S RELATIVE GOLD SUPPLY, COMPARED WITH THE PRICES THEMSELVES

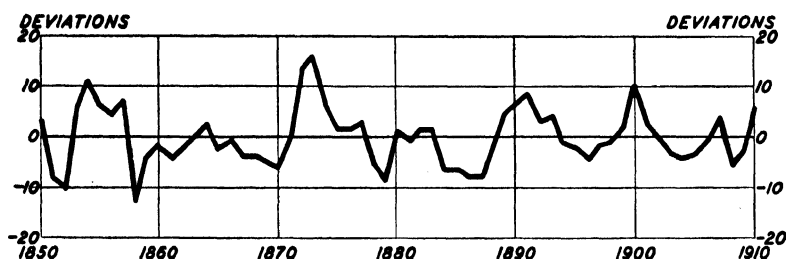


(taken from Woytinsky's article, page 15) shows that the trend of the ratio of prices to Cassel's relative gold supply has essentially the same trend as the price curve itself, though the deviations from the horizontal are only about one-half as great.

² W. Woytinsky, "Das Rätzel der langen Wellen," *Schmoller's Jahrbuch*, 1931, 55 Jahrgang, Heft IV, pp. 1-42.

With reference to Kitchin's work the results of Woytinsky's analysis are more favorable. He shows in the first place that the trend of the wholesale price index is actually eliminated by dividing through by the items in Kitchin's curve of the relative monetary supply—as is illustrated by the accompanying diagram, taken from

RATIOS OF SAUERBECK'S PRICES TO KITCHIN'S
RELATIVE MONETARY GOLD SUPPLY



page 26 of Woytinsky's article. He also shows that a curve fitted by the method of least squares to the price data conforms to Kitchin's curve of the relative monetary supply in an "astonishing" way. He therefore concludes that Kitchin's work is vindicated by his own more elaborate statistical analysis.

Woytinsky then carries Kitchin's analysis one step further by computing the normal rate of increase in the monetary gold supply on the basis of the straight line trend of the logarithms of the ratios of the money items to the corresponding price items (that is, the trend of $\log 100 m - \log p$). He gets a normal rate of increase of 3.142 per cent instead of Kitchin's 3.096 per cent—starting from a base of 232.4 instead of 230. This difference in the growth ratios is due almost entirely to the fact that the ratio for 1910 is slightly below the trend of the ratios for that date; in other words, that prices were a little higher than normal in proportion to the money stock. It will be remembered that Phinney criticized

Cassel for the use of actual instead of trend values for 1850 and 1910,⁸ but Phinney showed trend values for both dates *higher* than the actual values. The difference between Phinney's and Woytinsky's findings on this point arises from the fact that Woytinsky has fitted a mathematical trend line to the data for 1850-1910 without utilizing data for the prices just before and just after the period of observation, whereas Phinney's trend lines are based on longer periods. In other words, what Woytinsky has done is to calculate a reasonable trend for the period 1850-1910, viewed in entire detachment from the price history of the rest of the nineteenth and twentieth centuries. In doing this he has started at the bottom of a severe price depression and ended at the bottom of a mild one. It was noted on page 26 with regard to Cassel's figures that a proper adjustment for the deviation of prices from normal at the beginning and end of the period would have slightly reduced the so-called normal growth ratio. The same point holds for the Kitchin figures, since Kitchin and Cassel have used the same price series. Woytinsky's correction has actually increased the error. In view of the probable errors in the data, however, all these differences are too small to be of any real significance for the growth requirements of the period as a whole. They do have a bearing on the question of how far the rise of prices in the early fifties is to be regarded as a direct effect of the gold discoveries. (Compare Appendix A.)

⁸ Compare above, p. 26.

APPENDIX C

ESTIMATES OF WORLD GOLD STOCK OF 1913

On pages 27-28 we stated our conclusion that Kitchin's estimate of world monetary gold stock for 1913, namely 7,728 million dollars, was much too low. We present here our reasons for this conclusion.

As was stated on page 27, Kitchin computed annual series of gold stocks used in his comparison of the price level with the monetary gold stock by starting with an assumed figure for 1849 and adding estimated annual increments. He added his consumption estimates (discussed on pages 71-72) to the reported Oriental importation, subtracted the sum from the year's reported production, and then added the remainder to the previous year's stock.

For 1913 his estimate made in this way checked fairly well with an estimate made by the Director of the United States Mint, Kitchin's figure being 7,728 million dollars and the Mint figure 7,674 million. However, the latter series is so erratic in its year-to-year movement that the agreement between the Mint's and Kitchin's figures for this particular year means little. The following table shows the wide variation in the extent of the agreement at successive years, and makes it clear that the Mint figures at least must be extremely inaccurate, since the world gold stocks could not possibly have exhibited such wide fluctuations. India and Egypt have been deducted from the Mint totals to secure comparability with Kitchin's figures. The data are in millions of dollars.

Year	Mint Estimate	Kitchin Estimate
1910	6,805	7,037
1911	7,271	7,250
1912	7,917	7,440
1913	7,674	7,728
1914	7,039	8,014

For 1913 we are able to present the results of independent studies made by Edie,¹ by Neisser,² and by the staff of the Gold Delegation.³ For 1913 Edie's estimate of the world stock of monetary gold was 8,781 million dollars, as compared with Kitchin's figure of 7,728 million, and with the United States Mint estimate of 7,674 million. Edie's estimate of the world stock for 1913 is a summation of estimates, mostly official, for different countries. His starting point is the Mint report and the corrections are derived chiefly from *Federal Reserve Bulletin* data published in the post-war years: a few corrections are drawn from other scattered sources. The most important change is the addition of 700 million dollars to the Mint figure of 1,200 million for France. There is also an addition of 131 million for Japan and about 150 million for nine other countries not listed in the Mint report, but this is more than offset by deductions, of which the most important are for gold hoarded in Egypt (131 million) and India (301 million).⁴

The increase in the estimated stock of France for 1913 resulted from the fact that the Bank of France was able to withdraw from circulation in the years between 1913 and 1928 a larger amount of gold coin than had been ex-

¹ Lionel D. Edie, *Capital, the Money Market, and Gold*, 1929, pp. 21-26.

² *Weltwirtschaftliches Archiv*, 32 Band, Heft I, 1930, p. 186.

³ *First Interim Report of the Gold Delegation of the Financial Committee*, League of Nations, p. 114.

⁴ Kitchin excludes Egypt and India entirely, but as Edie notes, this is unjustified since actual gold coin was the principal medium of exchange in Egypt and since the central gold reserve of India was serving a definite monetary purpose.

pected on the basis of the pre-war estimate of gold in circulation. Edie's figure of 1,900 million dollars was an estimate made by the Bank of France in August 1928.

This figure is probably too high⁵ but the staff of the Gold Delegation, presumably in consultation with authorities of the Bank of France, estimated the figure at 1,700 million,⁶ which is considerably nearer to the 1928 estimate of the Bank of France, accepted by Edie, than it is to the Mint estimate accepted by Kitchin. The Gold Delegation's estimate was made in two ways: first, by adding to the net gold coinage after 1803 other Latin gold union coins in proportions based on the currency census of 1909; second, by deducting estimated industrial gold consumption from net imports of gold over the same period. The two estimates checked almost exactly.

Neisser's methods are similar to Edie's, though the sources used for the two estimates, aside from the Mint report, are mostly different. His figure differs widely from Edie's for certain countries, but his total for 1913 is almost as high—35,861 marks, or about 8,535 million dollars.

Finally, the staff of the Gold Delegation prepared an estimate which is probably better than either of the others as the staff had the benefit of Kitchin's, Edie's, and Neisser's work and also had the co-operation of important central banks. In regard to individual countries, the Delegation's estimates differ widely from both Edie's and Neisser's, but the three are in close agreement in regard to the total for 1913. The Delegation's figure is 8,773 million dollars, which is almost exactly the same as Edie's estimate.

⁵ Compare *The International Gold Problem*, pp. 70-71.

⁶ *First Interim Report*, p. 114.

INDEX

INDEX

- Anderson, P. M., 55
- Barbour, Percy E., 59
- Canada, gold production of, 59-60
- Cassel, Gustav, 18-26, 27-28, 32, 41, 136, 202-04
- Chadwick, D., price index, 185-86
- Coinage, of gold, 36
- Consumption of gold, industrial, 69-77
- Devaluation, in United States, 165-73
of South African pound, 54
- Economist* index, 194
- Edie, Lionel D., 18, 25, 28-30, 71, 73, 75-76, 206-07
- England, Bank of, gold policy, 161-62
- Federal Reserve system, policy of, 157-58
- Fisher, Irving, 12
- France, Bank of, gold policy of, 158-60
- Genoa Conference, 5
- Germany, gold reserves of, 106
- Gold Delegation of the League of Nations, 7, 33, 75-76, 79, 84-85, 207
- Gold-exchange standard, 35-36.
- Gold, production of, 43-44
- Gold supply,
relationship to prices, pre-war, 18-32, 130-47; post-war, 32-40, 148-64
relative, 19
- Great Britain, gold position of, 187-88
- Hawtrey, R. G., 24
- Helfferrich, Karl, 42
- Hoarding of gold, 80-82
- India, gold absorption and release, 77-80
- Interest rates, 83-84
- International movements of gold, 95-100, 115-21
- Jevons index, 178-81, 188-91
- Keynes, J. M., 177
- Kitchin, Joseph, 18, 26-28, 32, 43, 44, 48-50, 56, 58, 61, 63, 71-72, 133, 202-04, 205-07
- Kotze, R. N., 45-47, 57
- Kursell, H. A., 45
- Labor supply, in South Africa, 52-54, 65-66
- Lawrie, H. N., 59
- Loveday, A., 3, 7, 34-38, 74-75, 84, 91, 200-02
- Low-Grade Ore Commission of South Africa, 64-68
- Mlynarski, F., 24, 26, 31-32
- Neisser, Hans, 71-72, 206-07
- Pasvolsky, Leo, 170
- Pearson, Frank A., 7, 18, 28, 72, 127-73
- Phinney, J. T., 25, 26, 188, 203
- Pirow, H., 46-48
- Prices, in South Africa, 50-51
- Quantity theory, of prices, 11-15
- Reserve requirements, 34-35
- Reserves, gold, 90-95, 156
- Russia, gold production of, 58-59

- Sauerbeck index, 178-81, 188-90, 194-95
Silberling, N., 188
Soetbeer, Adolph, estimates of gold consumption, 70
South Africa, as gold producer, 45-58
Stability, of prices, 9-10, 11-15
Strakosch, H., 7
Strauss, S. D., 60
Tucker, Rufus S., 133; Appendix A
United States, gold holdings of, 104-15
Warren, G. F., 7, 18, 28, 72, 127-73
Wilcoxon, L. C., 26, 30-31
Wood, G. H., price index, 184-86
Woytinsky, W., 18, 26, 28, 202-04

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